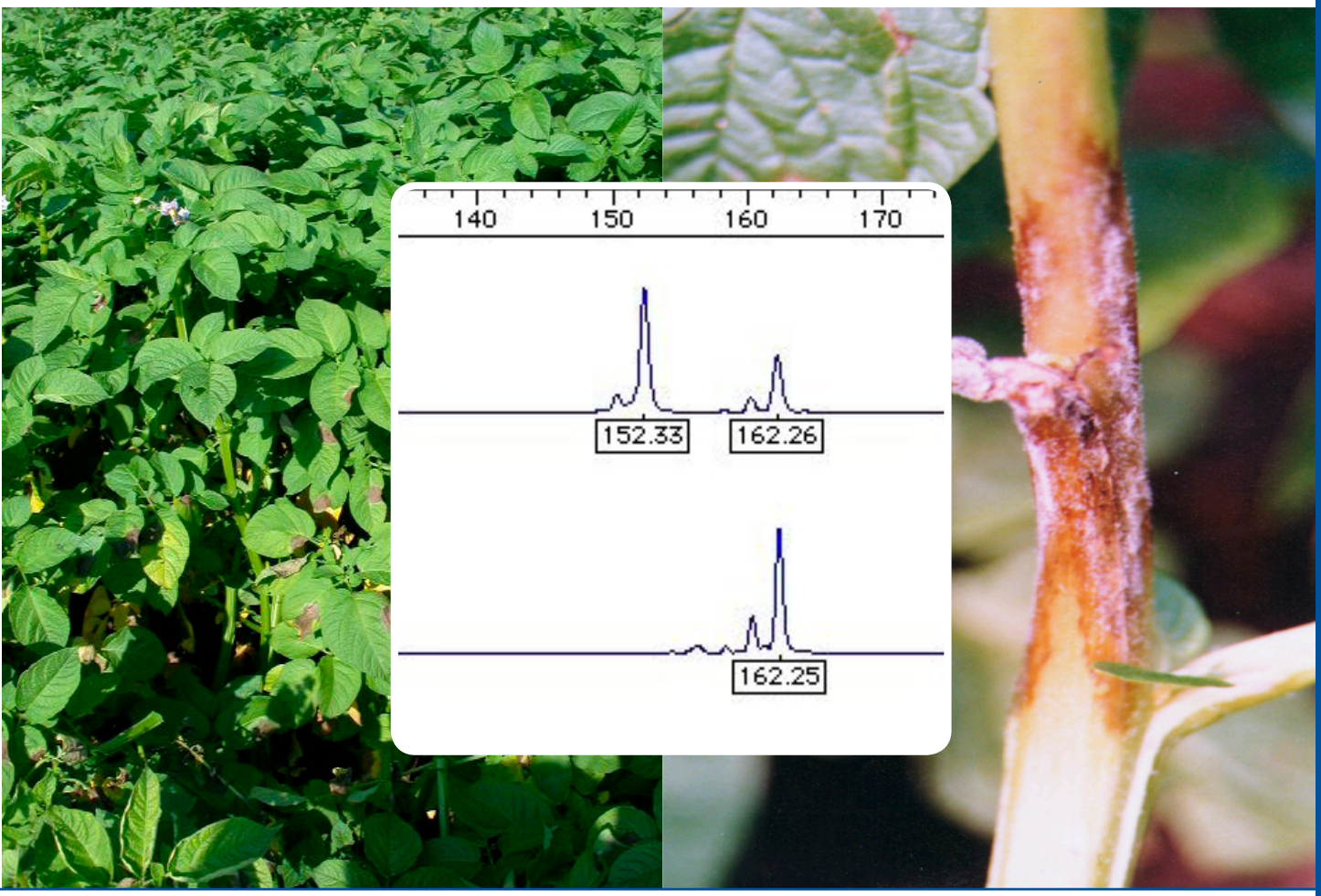
Internal report

Phytophthora.exe ver 2.0

PC-program for the storage and upload of *Phytophthora infestans* isolate information to the EUCABLIGHT database

User manual

Jens Grønbech Hansen, Poul Lassen, David Cooke & Alison Lees



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Faculty of Argricultural Sciences

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User manual

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1 Foreword

This manual describes Phytophthora.exe (P. exe) – a PC-program for the upload of phenotypic and genotypic *Phytophthora infestans* data to the EUCABLIGHT database. The first version of the program and its associated databases were developed within the framework of the EU concerted action project 'EUCABLIGHT – A Late Blight Network For Europe' (2003-2006).

Membership of this network is not restricted to partners already in the EUCABLIGHT consortium, and the pathogen database has been designed to store and process data from any region of the world. Recently, a version for use in South and Central America was released (March, 2008). Through the collection and analysis of a comprehensive data set, we will be able to answer important questions about the biology and evolution of this devastating disease. The P.exe program provides the key tool for local storage, and transfer, of these data to the central database.

Methods used for processing of data and its presentation on the EUCABLIGHT web site is not discussed in this manual. Please refer to the EUCABLIGHT web site: http://www.EUCABLIGHT.org for further information.

This update of the user manual will only be available in electronic form (pdf) and downloadable from the EUCABLIGHT web site.

Foulum, 25 March 2008

Jens Grønbech Hansen, Poul Lassen, David Cooke & Alison Lees

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2 Introduction to Phytophthora.exe

2.1 EUCABLIGHT

The European Concerted Action on Blight, or, 'EUCABLIGHT' (A Late Blight Network for Europe)' as it is also known, was co-ordinated by The Scottish Crop Research Institute in Dundee, Scotland and ran for 3 years from 1 February 2003 – 31 January 2006. The EUCABLIGHT consortium consisted of a group of 24 European partners from 14 European countries with varied expertise in both host and pathogen research.

The European Union's Concerted Actions are intended to support the co-ordination of RTD tasks already financed at national level where the pooling of data would facilitate common interpretation of facts and contribute to the development of harmonised standards, procedures, methodologies, processes or common research instruments.

The project was organised in three geographic regions: Western Europe, which was administered by Didier Andrivon, INRA; Central Europe (Ewa Zimnoch-Guzowska, IHAR) and Nordic Europe (Arne Hermansen, NCRI). There were two themes that ran across these regions. The first, 'Characterising host resistance' was led by Leontine Colon at PRI in The Netherlands and the second 'Characterising pathogen variation' by David Cooke at SCRI. The databases and website were implemented by Jens G. Hansen and Poul Lassen at AU in Denmark.

2.2 Rationale for collecting information on pathogen characteristics

In an industry striving towards reduced or even zero inputs of agrochemicals, the monitoring of *Phytophthora infestans* populations remains a key aspect in the design of effective strategies for late blight management. The main management tools are the avoidance of primary inoculum via good cropping practices and quality seed, the timely use of fungicides and the effective deployment of host resistance. The success of each of these options will be influenced by the nature of the pathogen population. For example, if both the A1 and A2 mating types are present in a region there is a significant risk of oospores acting as primary inoculum as well as an increase in the rate at which *P. infestans* adapts, or evolves, to overcome other management strategies. The emergence of phenylamide resistance and subsequent control failures demonstrated the threat that fungicide resistance poses and the need to monitor populations for their sensitivity to phenylamides and other active ingredients. Similarly, the tracking of virulence and aggressiveness in *P. infestans* populations has helped to understand failures in past R gene deployment and such monitoring is important for planning breeding and future resistance deployment strategies. If resistance is deployed effectively it should create a 'moving target' and reduce the impact of late blight on the potato industry. Such *P. infestans* monitoring thus allows the potato industry to be proactive in adjusting its approaches to late blight management according to the data on contemporary pathogen populations and the

threats they pose. There is however a reliance on understanding the existing pathogen population structure and data to help predict its ongoing evolution.

All of the above factors are important on a local to regional scale but there are also significant issues at national and international scales over longer time periods. The global tracking of major lineages of *P. infestans* will enable the early identification of major changes in population structure suggestive of newly introduced exotic strains, breakdowns of significant sources of resistance or the widespread failure of a key chemical active ingredient. There are also issues in terms of quarantine and international trade to consider. In the case of *P. infestans* there is a well-documented history of global migrations influencing disease management and statutory bodies need sound data upon which to base their risk assessments.

Surveys to date have tended to be on a national scale but a comprehensive pan-European assessment of *P. infestans* populations is lacking. In the U.S.A., a standardised naming system for isolates based on molecular (RG57 and mtDNA) and phenotypic data was adopted and has proved useful in monitoring the distribution of major clonal lineages. Sexual reproduction is, in many countries, blurring the boundaries of such well-defined lineages and existing genetic markers are not always suited to the type of detailed analyses needed. New objective, allele-specific, co-dominant markers need to be applied to meet this challenge. Ongoing programmes of marker development and genomics research has now yielded markers such as Simple Sequence Repeats (SSRs) or microsatellites that are appropriate for the analysis of isolates of diverse origin. The development and application of objective, co-dominant SSR markers will accelerate the understanding of *P. infestans* populations and the availability of protocols and an expanding database of such marker data form a significant part of the EU-CABLIGHT project.

The use of molecular markers has increased the resolving power of *P. infestans* surveys but has also highlighted a critical need for standardised methods amongst different research groups. It is not only the methods that needed standardisation but the type of data collected and the way it is stored. The construction of a single comprehensive database is fundamental to this standardisation and provides a means by which data collected by different labs can be compared meaningfully. The data entry tool Phytophthora.exe provides a user-friendly interface that facilitates data entry and its seamless submission to the database. This will foster international collaboration, firstly between European labs, and then on a global scale. Clearly marker technology and data on *P. infestans* genetic variation is expanding rapidly, and the data collection tools and databases need to expand accordingly.

2.3 Organisation and tools for the collection of pathogen data

A thematic Group (TG_Pathogen) is responsible for the establishment of a comprehensive network looking at the population biology of *P. infestans* across Europe. The network are collecting and collating existing and new phenotypic and genotypic data from *P. infestans*

collections. Several protocols for the characterisation of *P. infestans* are now published on the EUCABLIGHT web site.

Clearly the more data that is collected, the more powerful the database will be and it is thus hoped that groups that were not formally part of the EUCABLIGHT project will get involved and submit data to build up the picture of *P. infestans* diversity on an unprecedented scale. If you are not a member of the consortium, but would like to submit pathogen data to EUCABLIGHT, please contact David Cooke, the chairman of TG Pathogen, (email: david.cooke@scri.ac.uk). If your data are appropriate for EUCABLIGHT, you will be provided with user name and password for the EUCABLIGHT web site. From here you can download the Phytophthora.exe program for entering data into your local database and uploading these data to the Eucablight database.

Using the Phytophthora.exe program will make it easy for you to store and transfer your more recently generated data (including SSR results) to EUCABLIGHT. Your data can then be compared directly with similar results from other regions and years in Europe.

Recently, a different version was developed for South and Central America including SA regions in drop down boxes, options to enter altitude and select other *Phytophthora* species such as *P. andina* as the pathogen, new host species, new markers and new allele options for existing markers. Importantly the main difference in P.exe – Europe and P.exe-SA is that you can only select countries and associated regions for one continent. When you log into the Eucablight web site you will find data from South America in the Europe overview table of pathogen data. This will be reorganised based on discussion among users of the system.

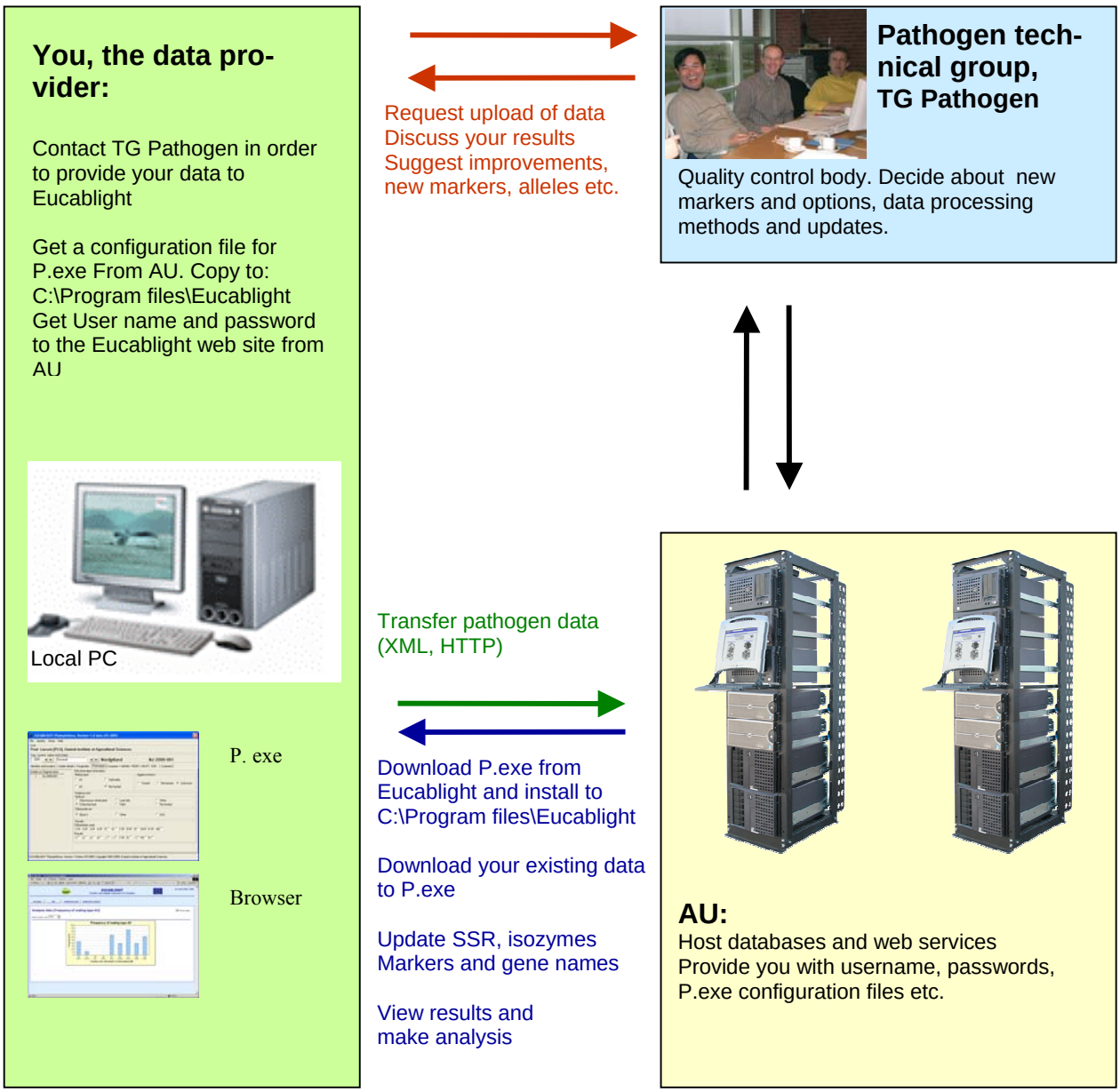

You, the data provider:
Contact TG Pathogen in order to provide your data to Eucablight
Get a configuration file for P.exe From AU. Copy to: C:\Program files\Eucablight
Get User name and password to the Eucablight web site from AU
Local PC
P. exe
Browser
Request upload of data
Discuss your results
Suggest improvements, new markers, alleles etc.
Pathogen technical group, TG Pathogen
Quality control body. Decide about new markers and options, data processing methods and updates.
Transfer pathogen data (XML, HTTP)
Download P.exe from Eucablight and install to C:\Program files\Eucablight
Download your existing data to P.exe
Update SSR, isozymes Markers and gene names
View results and make analysis
AU:
Host databases and web services
Provide you with username, passwords, P.exe configuration files etc.

Figure 1. Organisation and dataflow of pathogen data between data providers, TG Pathogen and the EUCABLIGHT database.

2.4 Phytophthora.exe and associated databases

The structure of the EUCABLIGHT pathogen database is documented in Annex 1. The key variables year, country, region and isolate ID facilitate the association of pathogen results with information in the host resistance database which uses the same key variables for year, country and region.

2.4.1 Upload existing ('Old') data

In addition to the isolate identification variables mentioned above, 'old' data also includes: metalaxyl resistance, virulence, mating type, isozymes and mtDNA haplotype. However, it is not possible to import SSR data from Excel. Following a quality control check by TG Pathogen, AU will import your data held in Excel spreadsheets into the EUCABLIGHT database. If you have SSR data for the same isolates, you should:

1. Ask TG Pathogen for a personal configuration file for Phytophthora.exe program including a login and password for the EUCABLIGHT web site.
2. Login to the EUCABLIGHT web site, download and install the Phytophthora.exe program.
3. Use Phytophthora.exe + configuration file to download your "old" data from the EUCABLIGHT database to your local P.exe database.
4. Enter your SSR data in P.exe.
5. Use P.exe to upload your total dataset including SSR data to the EUCABLIGHT database.

2.4.2 Upload new data using Phytophtora.exe

If you generate new data, please always use the P.exe software that is a user-friendly tool for the entry of primary data because minimal typing is necessary and your data is easily exported into Excel for your own analysis or for the exchange of data between partners. P.exe can be used to transfer all your data to EUCABLIGHT. Data will then be processed automatically and shown in graphs and tables immediately. If the processed results indicate that there are some errors or mistakes in your data then correct it and transfer again. When the EUCABLIGHT database is updated with new markers and allele sizes, your local P.exe program can be updated via a special webpage, accessible from P.exe.

2.4.3 I've changed my PC – What do I do?

If you change your PC, then install the newest version of P.exe on the new PC and request AU for a new configuration file (Program version number and number in configuration file must match, see section 4.1). If data in your local Phytophthora.exe program was identical with data in the EUCABLIGHT database, then download your own data from the EUCABLIGHT database to your new P.exe program. If your data in the EUCABLIGHT database were only a subset of the total amount of data you had in your P.exe program, then you can restore your data from your backup files (see section 2.4.4).

2.4.4 Backup of data on your local PC

Each time the P.exe program is closed, a backup of your data is stored on your local PC (unless rejected by you) and it can therefore be restored if P.exe crashes or is deleted by mistake. If you change PC you can install P.exe on the new PC, copy the backup files from the

old PC to the new PC, at C:\Program files\EUCABLIGHT\Backup and then select ‘Restore’ under the File menu in P.exe.

2.4.5 P.exe on multiple PCs per institute or not?

It is recommended to use only one version of P.exe + configuration file per institution for the transfer of data to the EUCABLIGHT database. For training, several versions can be installed and backup files restored with real data can then be experimented with. If one lab generates SSR results for several countries in a network project, it will be possible to upload the SSR data from one computer in the lab where results were generated. This means that all isolates will have the same User ID key but different information about the owner. After upload, AU can change the user ID in the database to national user IDs for the isolates uploaded. The national users will then be able to download their own results from the EUCABLIGHT database to a local P.exe database and enter additional results. This solution will require a written agreement with DIAS.

2.4.6 Key variables link to host resistance information

The same key variables, year, country and region ID are used for both pathogen data and host resistance data. This means that the two kinds of information – pathogen characteristics and host resistance information - can be linked on a regional level. The region names and associated ID´s can be found on the EUCABLIGHT web site.

2.5 Information available in EUCABLIGHT

When you have transferred your data to the EUCABLIGHT database, your data will be processed into several summary statistics, graphs and tables. There will be query options for comparing pathogen populations between years, countries and regions etc. The questions EUCABLIGHT can answer will depend on the amount and the quality of data in the database and the methods applied to the data, both of which will evolve depending on future activities beyond the EUCABLIGHT project period. For further information, please refer to the EUCABLIGHT web site.

2.6 Intellectual Property Rights

Data suppliers are asked to confirm that they are willing to have summaries of their data shown on the website. No raw data will be presented or released to any third party. To obtain raw data from another supplier you must contact that supplier directly to obtain the data. Use ‘Export to csv file’ in the P.exe program to export data from your local database.

3 Software and hardware requirements

To run Phytophthora.exe you will need Windows 98, or higher. The program can be opened and data stored in the local database, but data cannot be transferred to Phytophthora.exe until you have a configuration file. This file contains user-specific information and code needed to transfer data between databases (see below). To view results on the Internet and to update isolates or markers from the EUCABLIGHT database to your local database you must have the browsers, Microsoft Internet Explorer 5.5 or higher or Netscape 6.5 or higher. We have not tested the system using other browsers.

4 Installation of Phytophthora.exe

Phytophthora.exe is available via the EUCABLIGHT homepage (http://www.eucablight.org).

Download the installation file to a temporary folder. Double click on the installation file and follow the instructions.

During the installation the proposed installation options may be changed, but we recommend that you accept the default settings proposed by the installation program. If you accept the proposed installation then select 'Next'.

After the installation the following will have occurred:

1. Phytophthora.exe has been installed in the directory:
   `C:\PROGRAM FILES\EUCABLIGHT`
2. Borland Database Engine 32 bit has been installed in the directory:

   `C:\PROGRAM FILES\BDE`

   In Borland Database Engine a path (Aliases) has been inserted to the database directory (`C:\PROGRAM FILES\EUCABLIGHT\DATABASE`).

3. The icon Phytophthora has been added into Windows menu Programs/EUCABLIGHT.
4. Four subdirectories have been created on your harddisk:

EUCABLIGHT\Backup	-Your backup files will be stored here
EUCABLIGHT\Database	-The P.exe database files
EUCABLIGHT\Download	-XML files downloaded from the EUCABLIGHT database for import to P.exe
EUCABLIGHT\Upload	-A copy of XML file with data transferred from P.exe to EUCABLIGHT

4.1 Configuration file

Data can only be transferred to EUCABLIGHT if you have a configuration file associated with Phytophthora.exe. To obtain this you must first contact David Cooke at SCRI (dcooke@scri.ac.uk) with an outline of the type and extent of data you want to submit. If the data are appropriate for entry you will be sent a configuration file (Phytophthora.cfg) from AU. The configuration file should be copied to the EUCABLIGHT directory – the same directory where Phytophthora.exe has been installed. When opening the software your name will be visible in the user information box. The configuration file is strictly personal. **Never use the same configuration file on more than one PC.** If another user uses your configuration file, your data in the EUCABLIGHT database will be overwritten. You also need the configuration file to download your own data to P.exe e.g. if you change your PC.

The version number of the P.exe program and the version number of the configuration file must match. If you update your P.exe program to a new version, you must request AU for a new configuration file. If there is a mis-match between the program and the configuration file you will get a message on the screen: 'The version of the configuration file does not match the version of the Phytophthora program. Please request a new configuration file or download a new version of the Phytophthora program.'

4.2 Using P.exe without a configuration file

You can use the P.exe program without the configuration file to store your results in the local P.exe database and export your results to Excel. You can also export to file formats needed for different data analysis software like Popgene and you can download new SSR markers and allele size options. A backup of your data will be stored on your own PC. Data manipulations and statistical analysis are not implemented in P.exe.

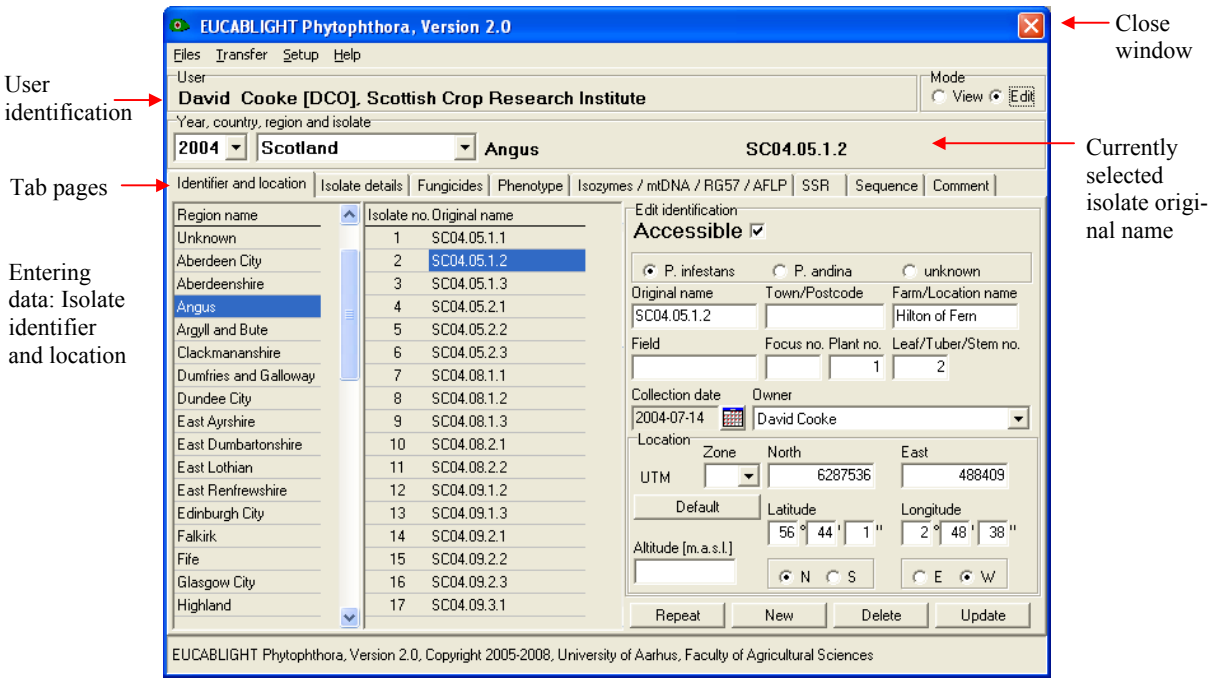
4.3 Send data to another server

In the configuration file your User identifications (user ID) and the address of the server that receives the data is specified. It is possible to change the server address in the configuration file. Data are transferred via HTTP file transfer in XML files.

4.4 New features in version 2.0

1. Separate release for either Europe or South and Central America.
2. Selection of current sample year and country is now done by drop-down boxes.
3. Information on altitude at the collection location for an isolate is now possible.
4. Selection of species name for an isolate is now possible (largely to accommodate the possibility of new species or related taxa such as *P. andina, P. mirabilis* etc.).
5. A whole new range of host species has been added, mostly for use in South America.
6. Sequence data can now be entered for an isolate.
7. Gene names for the sequence data can be downloaded from the EUCABLIGHT web site.
8. Sequence data can be exported in FASTA format.
9. An option to hide SSR markers that are not required for data entry.
10. Data are now transferred in smaller sections based on country and year combinations. Maximum file size is now 5 Mb in P.exe. File format for transfer of data is Phytophthora_userInit_sampleYear_countrycode.XML. File format for download of data is Isolate_userInit_sampleYear_countrycode.XML.
11. Under Files menu is a new menu item, 'Show isolate statistics in browser'. It will open your browser and show an overview of your local data on country and year level. A similar table can be generated after login on Eucablight. Use those two tables to compare your local data with data that all ready exists in the Eucablight database.

5 Getting started with Phytophthora.exe



User identification is taken from the Phytophthora.cfg configuration file (see section 4.1), but you can use the program without a configuration file (see section 4.2)

Quick start

1. Ensure the Identifier and location tab page is selected
2. Select Edit mode to be able to enter information. In view mode you can move around, but you can not make any changes to data entered or options selected.
3. Select the year, country and region where the isolate was collected.
4. Click with the mouse on New on the Identifier and location tab page to generate a single database entry for the isolate details.
5. Enter information about the owner of the data. Select Setup and then Owner.
6. Enter a list of cultivar names represented in your data. Select Setup and then Cultivar
7. Enter isolate information for your first isolate via the tab pages
8. Click Repeat to duplicate the previous entry and then edit the information in the new entry or New to generate a new blank entry and edit information for next isolate etc.
9. When you have entered information for your isolates then select Transfer menu and then Your own isolates and then to the Eucablight database (only possible if you have the configuration file)

Fields and buttons	Explanation
Main window	When you execute Phytophthora.exe you will immediately go to the main window of the program. When you close and open the program after you have entered some data, it will open on the page and with settings as when you closed it down last time.
User identification	User information is uploaded into the user window from a binary coded configuration file (Phytophthora.cfg) provided by AU. The configuration file must be in the same directory as the Phytophthora program. Without the binary configuration file you can use the program locally (see section 4.2), but will not be able to send data to the EUCABLIGHT server. If your user information is not shown or is incorrect then contact David Cooke before proceeding. The version of the program and the configuration file must match (see section 4.1)
Mode	When you select View mode, you can see but not edit all settings and selections in the program. Select this mode when you do not intend to change or enter anything, but only want to check or show your data to a colleague. Select Edit mode to enter new data or change existing data.
Year	The default is the current year. The year can be changed using thedrop down box. Currently, the years 1980-2015 can be selected.
Country	Select the country where the isolates were collected using the drop down box. If the country is not listed then contact David Cooke.
Region	The regions for each country appear once the country is selected. If the region is not known then select "Unknown". Please make every effort to identify the region as such regional data improves the analysis.
Isolate name	The name of the currently selected isolate is shown
Identifier and location Tab page	Enter information to identify the isolate including the original name and where and when it was collected. This page also contains buttons to add or delete database entries and update the local database.
Isolate details Tab page	Enter more detailed information about the isolates origins i.e. isolate origin, type, which crop and variety it was collected from etc.
Fungicides tab page	Enter information about fungicide use in the field where the isolate was collected and any fungicide resistance testing.
Phenotype Tab page	Enter phenotypic data for the isolate i.e. mating type and virulence.
Isozyme/RG57/ AFLP tab page	Enter results for isozyme analysis, mtDNA type, RG57 genotype and if AFLP data are available for the isolate.
SSR tab page	Enter results for microsatellite (SSR) genotype analysis. If markers or alleles are missing please contact David Cooke.
Sequence tab page	Enter results for sequenced region, GenBank Accession number and sequence result.

Comments Please add any relevant comments that will aid data interpretation – these may be edited at any time.

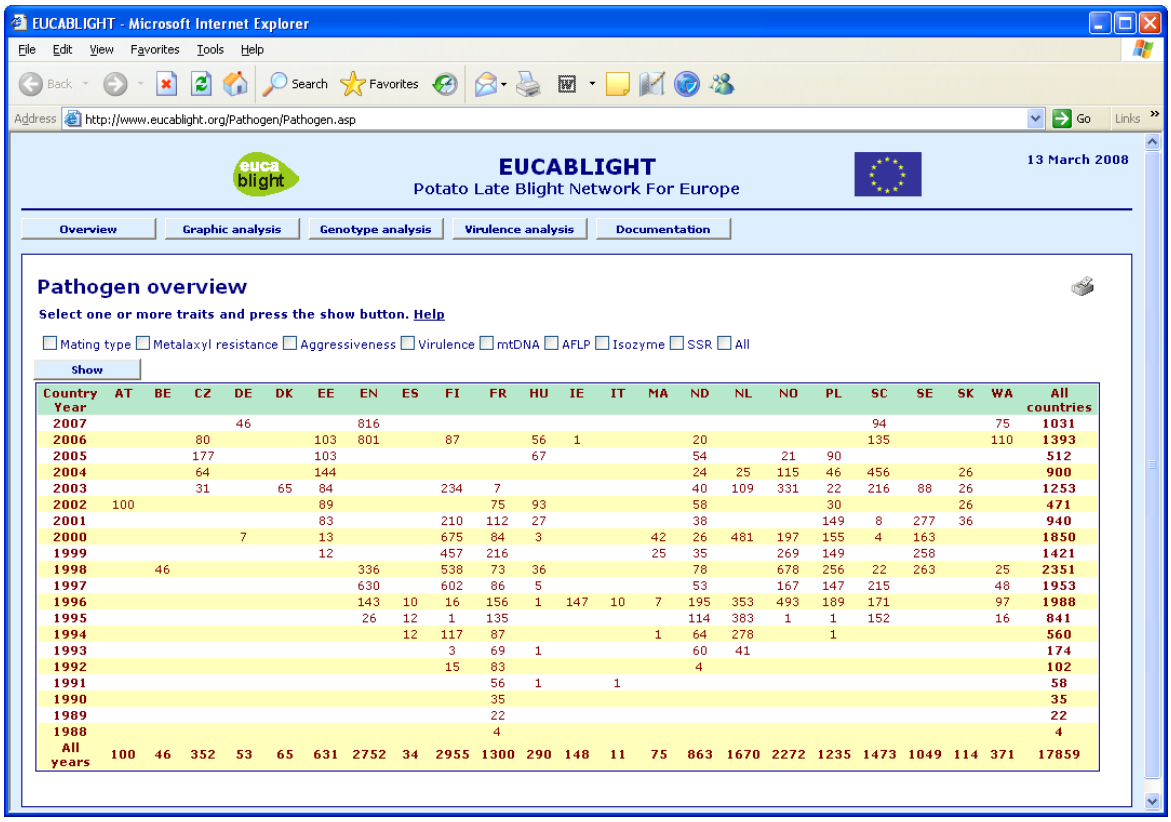
File menu Via the Files menu you can Backup and Restore data, Empty database (Phytophthora.exe local database), Export data to a csv–file or files formatted for analysis in software i.e. Popgene and Popdist, sequence data in FASTA format or get an overview of data in your local database by the option Show all Isolates in browser and Show isolate statistics in browser.

Transfer menu Use this menu for exchange of data and information between P.exe and the EUCABLIGHT database. Select Transfer > Your own isolates > to the Eucablight database for uploading your data to the EUCABLIGHT database. Select Transfer > Your own isolates > from the Eucablight database to update your local Phytophthora.exe program with your data available in the EUCABLIGHT database. This is relevant if you have uploaded "old" pathogen data via the predefined Excel and you want to add SSR results or append new data, or, if you change computer, and want your data downloaded to your newly installed P.exe program. Under the menu Transfer, you can also download new SSR, Isozymes markers and associated options, and Gene/sequence names. Find detailed information about how to Transfer in section 13: 'Transfer isolate data, and download new markers and options from Eucablight'.

Setup menu Under Setup you can select Owner and create a list of Owners for your data. This list will be available in a drop down box on the Identifier and location tab page. Access to primary data is only possible via a personal contact to the owner of data. You can select Cultivar and create a list of cultivar names present in your data. This list will then be available in a drop down box on the Isolate details tab page. Tick SSR Marker names to be shown on the SSR tab page. This is helpful as the optional list becomes longer and longer and you might use only a part of them. Finally, you can tick hints on and off.

Help Information about the program developer and version number. Currently version 2.0.

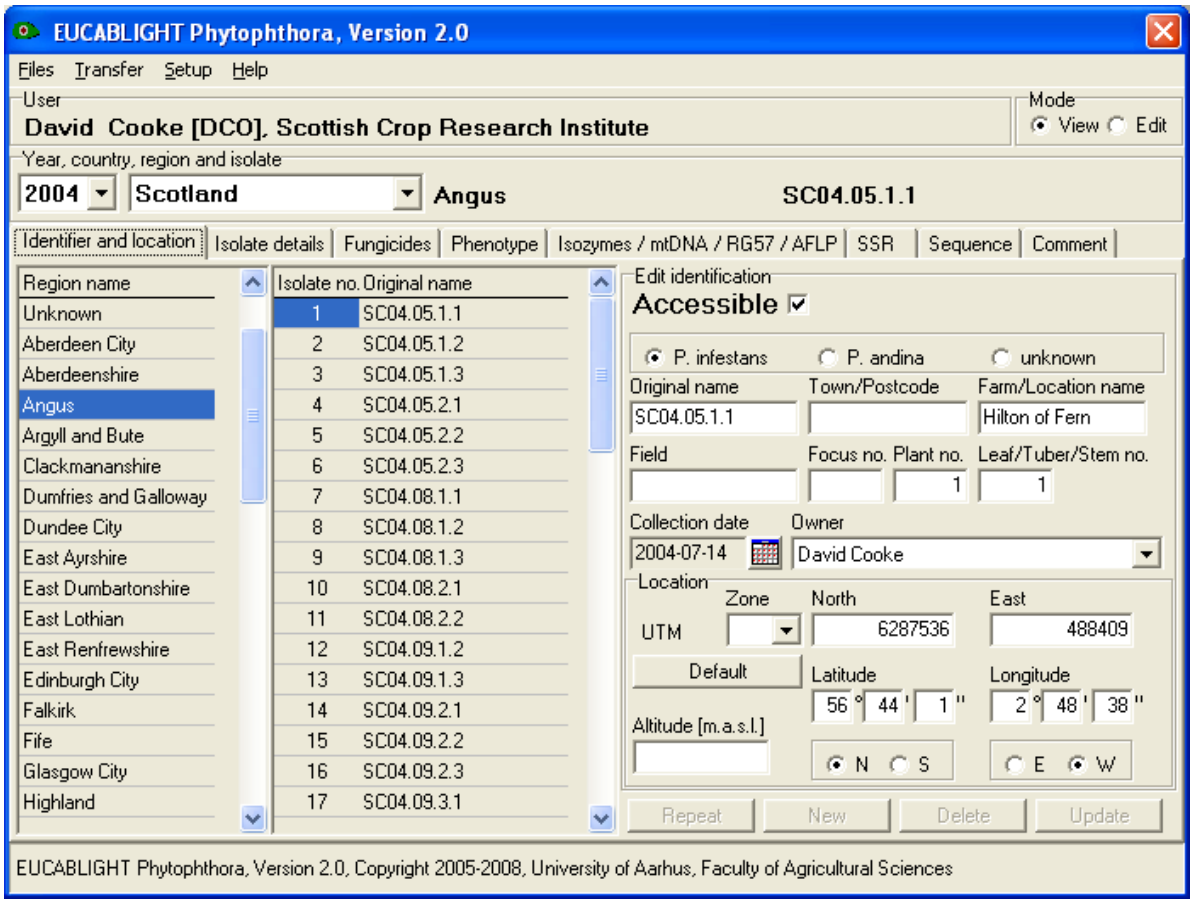
Tip! Select under Files menu 'Show all isolates in browser' to get an overview of the data you have in your Phytophthora.exe local database, or,
Select under Files menu 'Show isolate statistics in browser'. It will open your browser and show an overview your local data on country and year level. A similar table can be generated after login on Eucablight. Use those two tables to compare your local data with data that all ready exists in the Eucablight database.



Country Year	AT	BE	CZ	DE	DK	EE	EN	ES	FI	FR	HU	IE	IT	MA	ND	NL	NO	PL	SC	SE	SK	WA	All countries
2007				46			816												94			75	1031
2006			80			103	801		87		56	1			20				135			110	1393
2005			177			103					67				54		21	90					512
2004			64			144									24	25	115	46	456		26		900
2003			31		65	84			234	7					40	109	331	22	216	88	26		1253
2002	100					89				75	93				58			30			26		471
2001						83			210	112	27				38			149	8	277	36		940
2000				7		13			675	84	3			42	26	481	197	155	4	163			1850
1999						12			457	216				25	35		269	149		258			1421
1998		46					336		538	73	36				78		678	256	22	263		25	2351
1997							630		602	86	5				53		167	147	215			48	1953
1996							143	10	16	156	1	147	10	7	195	353	493	189	171			97	1988
1995							26	12	1	135					114	383	1	1	152			16	841
1994								12	117	87				1	64	278		1					560
1993									3	69	1				60	41							174
1992									15	83					4								102
1991										56	1		1										58
1990										35													35
1989										22													22
1988										4													4
All years	100	46	352	53	65	631	2752	34	2955	1300	290	148	11	75	863	1670	2272	1235	1473	1049	114	371	17859

On the Eucablight website, you can see how many isolates you have in the Eucablight database (no checkmarks). You can put a checkmark for e.g. mating type and see how many isolates you have in the database with information on mating type. If you tick both mating type and metalaxyl resistance, the table will show how many isolates have information on both mating type **and** metalaxyl resistance.

6 Entering information for isolate identifier and location



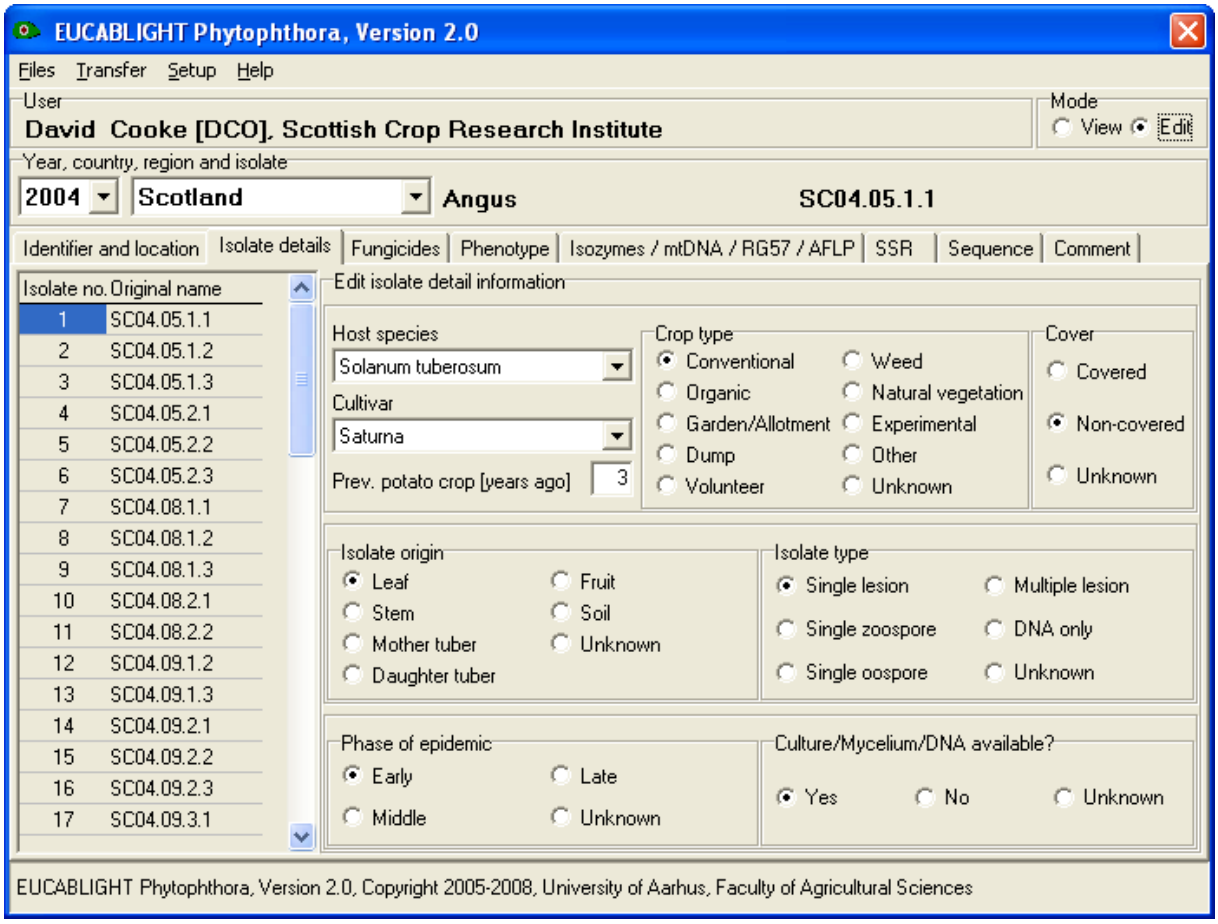
Tip! If you have multiple isolates from the same region and year with many identical features, enter those features for one isolate and press the repeat button an appropriate number of times to duplicate the entry. You then only need to edit the varying features for all the duplicate entries. Don't forget to change the isolate's original name in each case.

Tip! Organise raw data into year and region first and enter data as blocks along these lines. This will save repeated flicking between different sections of the database in the data entry tool.

Fields and buttons	Explanation
New	When you open the program for the first time you must select New to make the first record in the local database. Then overwrite the default settings in the text-boxes, radio buttons (O) and checkboxes (□). To make a new record select New or Repeat.
Repeat	Select Repeat to make a copy of the record (isolate) currently selected. Select first an isolate with similar ID and/or results as for the new isolate. Select then Repeat to copy all results to the new isolate. Use with care
Delete	Delete all information in the local database for the selected isolate.
Update	Update the local database with information entered on current tab page.
Accessible	If checked data derived from this isolate will be presented on the public side of the web site It is presumed that the majority of data will be available but this box does give an option for entering data and agreeing release at a later date.
Original name	Original name or code ID of the isolate. Although the database will create a unique entry for your isolate, this original name is important, as it is the only reference point back to your original records. We recommend adding the country code to the start of the name as many groups use a similar naming convention (e.g. SC04.2.1.1 rather than simply 04.2.1.1). ISO country codes should be used.
Town	Name of nearest town or village. This should be easy for other users to find in the future. A settlement large enough to be named on a 1:200,000-scale national road atlas for example. Alternatively enter the Postal code.
Farm	Farm name where the isolate was collected. This data will not be used on the public side of the web site.
Field	Field name where the isolate was collected. This data will not be used on the public side of the web site but can be useful to distinguish multiple isolates collected in the same region, or, to define a population (all isolates collected in the same field then defined as a population).
Focus no	Focus number where the isolate was collected (1…) at field level. If more than one focus per field collected then name foci here.
Plant no	Plant number where the isolate was collected (1…) at focus level. At SCRI for example we sample from 5 plants per field and these are numbered 1-5 here.
Leaf/tuber/stem no	Leaf, tuber or stem no where the isolate was collected (1…) at plant level.
Collection date	The date when the isolate was collected. Click on the calendar icon and select the date. You cannot change the year using the calendar.
Owner	Name of the owner of data (not the User of P.exe). This person should remain contactable for the foreseeable future. NB the User of P.exe and the owner can be same person but need not be.

Location	Geographical position where the isolate was collected. Enter as UTM or latitude/longitude. Selecting default will show the geographical position of the centre of the selected region. Then correct position. Do not forget to check the N/S and E/W boxes. More about UTM zones including a converter from Latitude/Longitude to UTM here: http://www.dmap.co.uk/utmworld.htm
Altitude [m.a.s.l.]	Metres above sea level. Add if appropriate, e.g. the tropics

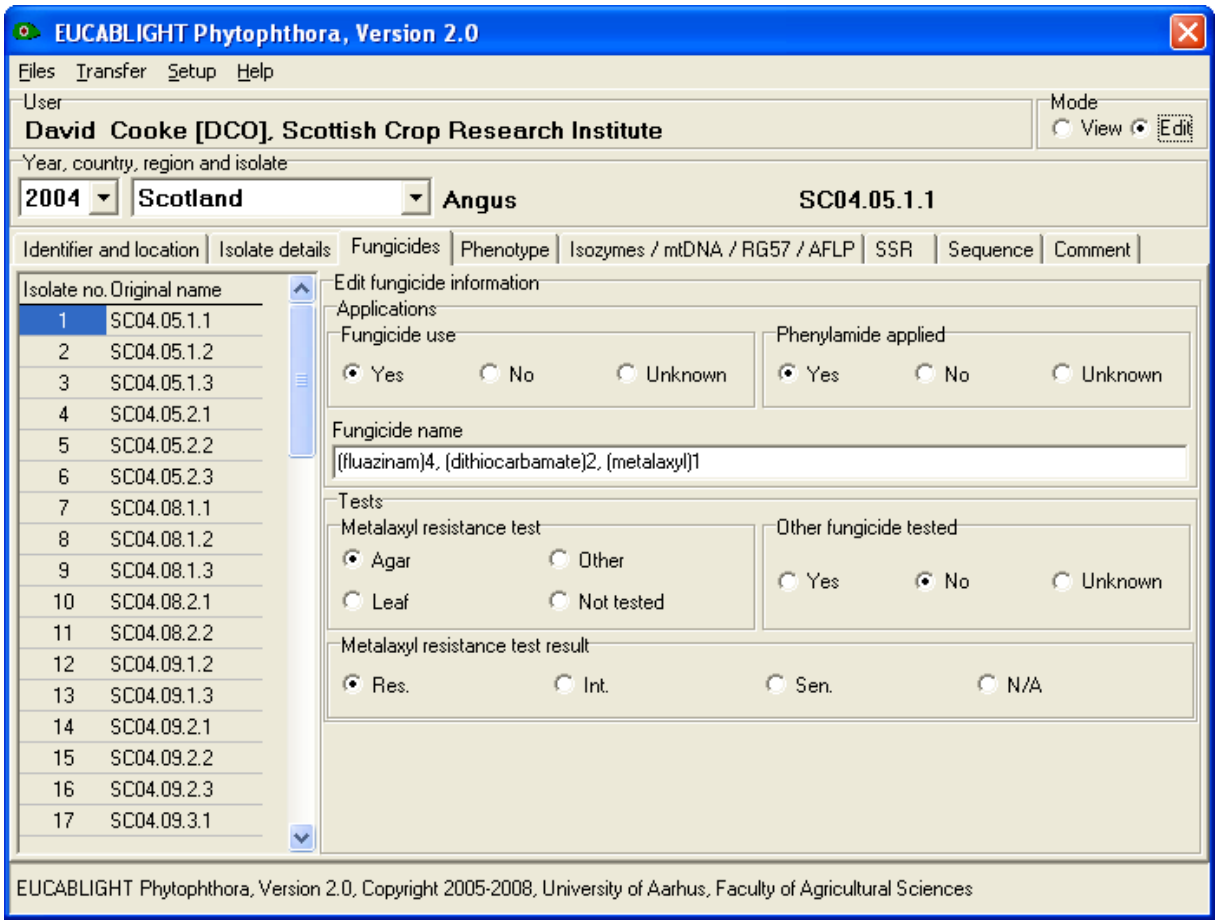
7 Isolate details



Tip! Each isolate can be selected from the list in the box to the left of the data entry section – the name of the currently selected isolate is shown in the top right section of the window above the SSR tab page button.

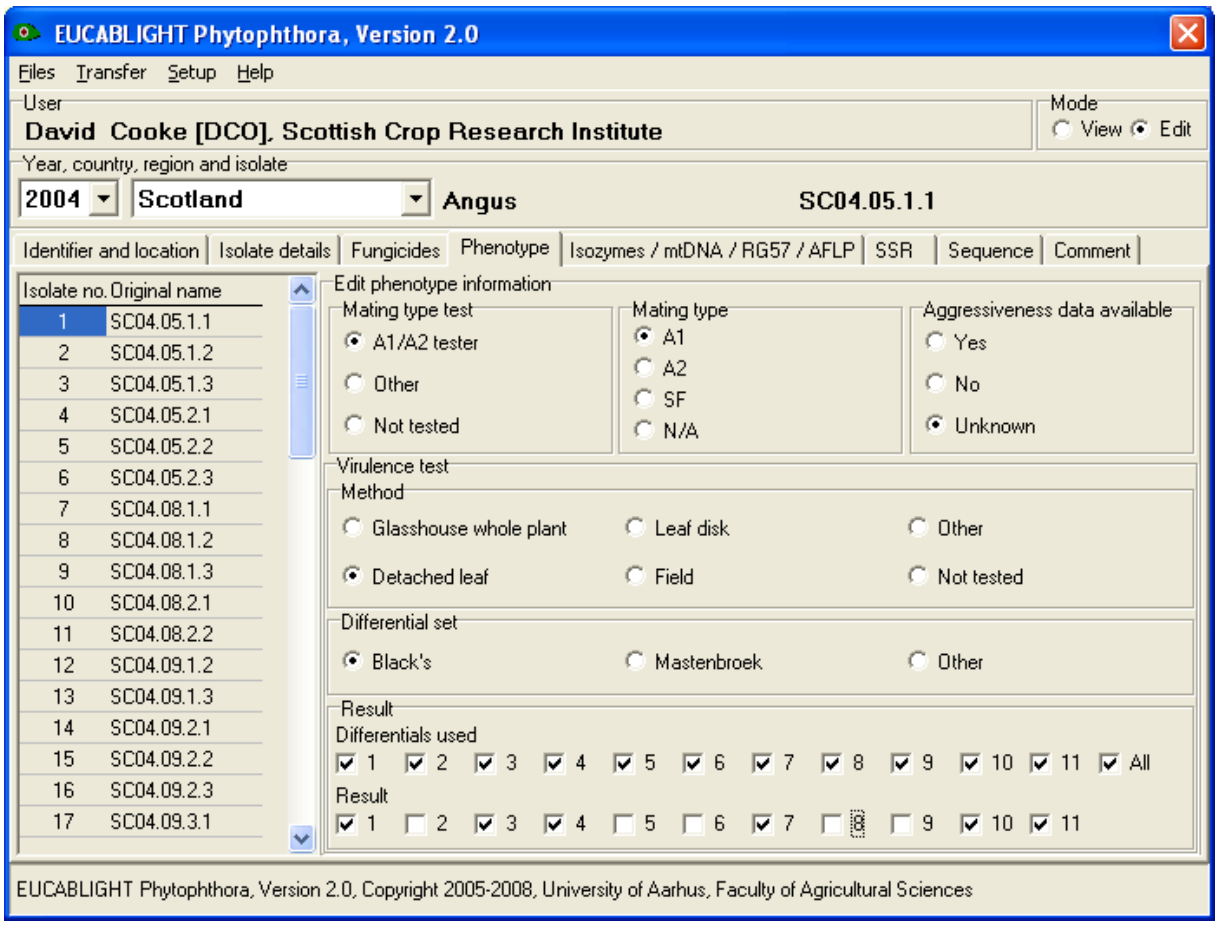
Fields and buttons	Explanation
Plant species	Select via the drop down box the plant species from which the isolate was recovered.
Plant variety	Select via the drop down box a cultivar name from which the isolate originated. Note, new cultivar names can be entered via *Setup* in the top menu.
Prev. potato crop	Write the number of years since potato last time was grown in the same field.
Crop type	Select one of the radio buttons for the type of crop from which the isolate was found. NB Conventional is a commercial crop and a dump refers to a waste potato tuber pile. Field trial is included in Experimental.
Cover	Specify whether the crop was covered with a film (e.g. fibre, plastic) or not.
Isolate origin	Select one of the radio buttons for the origin of the isolate.
Isolate type	Select one of the radio buttons for type of the isolate. If no isolation was carried out but DNA was fingerprinted directly from the leaf then select 'DNA only'.
Phase of epidemic	Select via the radio buttons the phase of the epidemic when the isolate was isolated. This data is intended as a subjective estimate to give a general feeling as to whether the epidemic is in the early stage with lesions only just present in the field or late with a higher level of disease.
Culture/Mycelium-/DNA available	Select via the radio buttons if any of the categories Culture/freeze-dried Mycelium or DNA can be made available to other groups.

8 Fungicides



Fields and buttons	Explanation
Fungicide use	Select whether fungicides have been used, or not, or 'unknown'.
Phenylamide applied	Specify if a phenylamide e.g. Ridomil has been applied during the season. This relates to the risk of Metalaxyl resistance of *P.i.* isolates.
Fungicide name	Active ingredients used, and if known, the number of times applied. Separate each product with a comma e.g. (mancozeb and metalaxyl-M) 2, fluazinam 4, dithane 1.
Metalaxyl resistance test	Specify whether the isolate has been tested for Metalaxyl resistance on agar, leaves or 'not tested'. If 'not tested' is selected, no data can be entered for Metalaxyl resistance test results (greyed-out).
Other fungicides tested	Specify whether resistance to other fungicides has been tested.
Metalaxyl resistance test result	Select one of the radio buttons for the test result of Metalaxyl resistance test. N/A is not applicable.

9 Phenotype

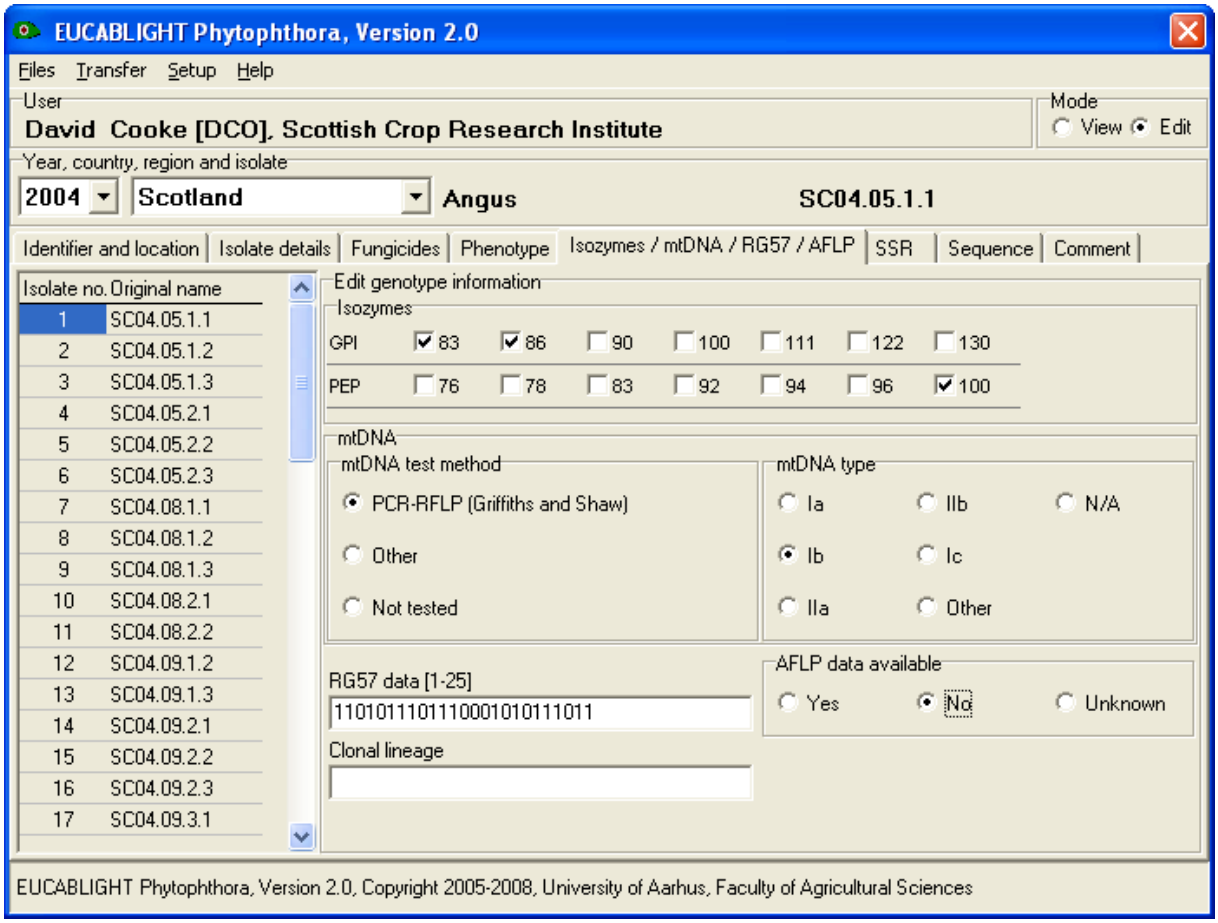


Tip! If you select Not tested for virulence test, the associated sections in the window for the test and test results are 'greyed out' – indicating that you cannot enter information into these sections.

Fields and buttons	Explanation
Mating type test	Specify if the isolate has been tested for mating type using the standard A1/A2 mating type test method (see protocol on the Eucablight web site), other test method or not tested.
Mating type	Select the mating type of the isolate.
Aggressiveness test	Specify whether the isolate has been tested for aggressiveness.
Virulence	Specify whether the isolate was tested for virulence and if yes, the method used.
Differential sets	Specify if Black´s differential set of varieties (see below) was used for the virulence test or another set of varieties or genotypes.
Virulence test results	In the top row of check boxes, please indicate which of the 11 differentials were included in the test. If you select All, then checkmarks will appear in all of the 11 check boxes. In the bottom row of check boxes, please put a checkmark if the result of the test for each of the 11 differentials was positive (late blight symptoms appeared). Leave blank if the result was negative. If the differential was not included in the test you will not be allowed to enter data into that box.

Black's differential series	
Craigs Snow White	R1
1512c(16)	R2
Pentland Ace	R3a
1563c (14)	R4
3053-18	R5
XD2-21	R6
2182ef(7)	R7
2424a(5)	R8
2573(2)	R9
3681ad(1)	R10
5008ab(6)	R11

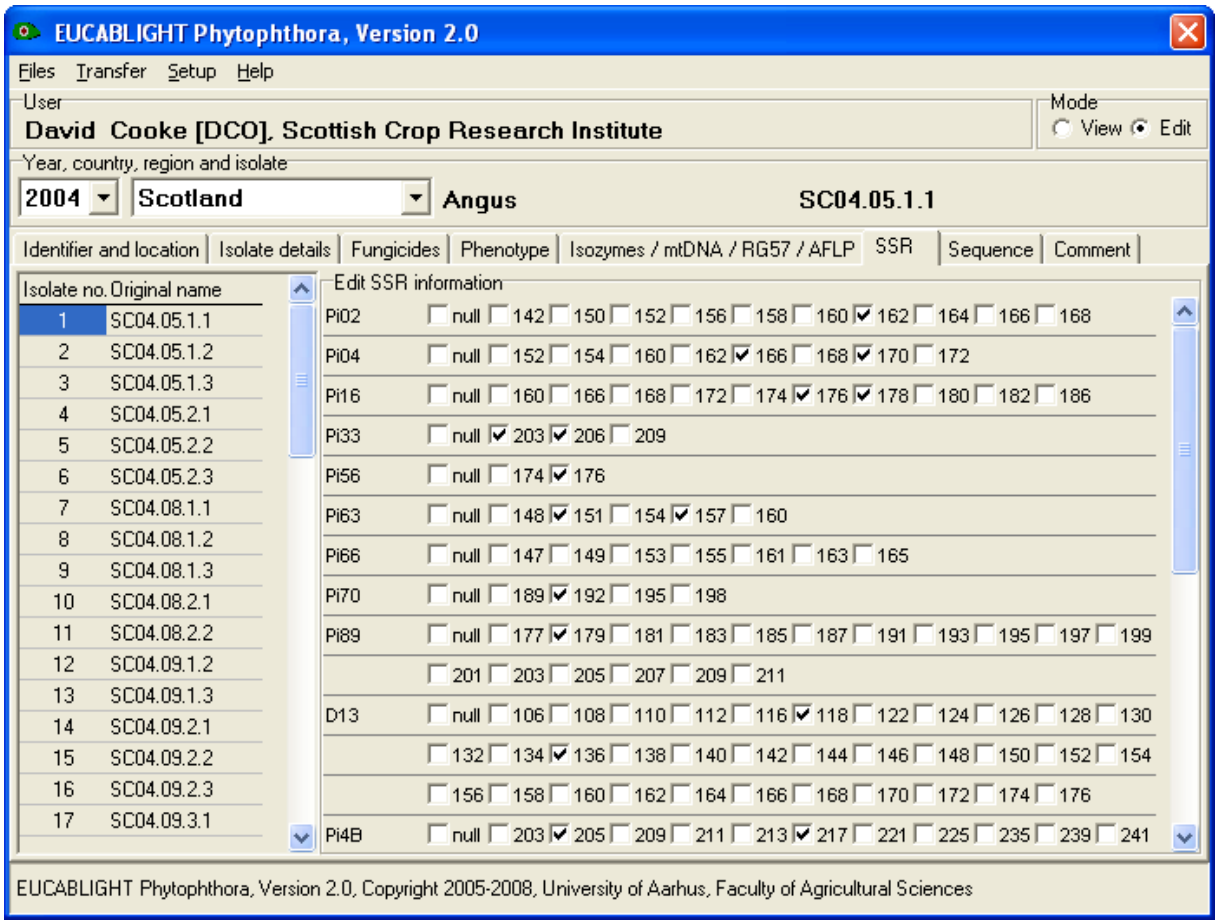
10 Isozymes/RG57/AFLP



Fields and buttons	Explanation
Isozymes	Select results for two (or three) markers for the *Glucose-6-phosphate isomerase (Gpi)* and the *Peptidase (Pep)* allozyme locus. Enter only the band results i.e. if you obtain one band at size 100, then only put a checkmark in the checkbox for 100. When data are extracted from the database it is assumed that the isolate is diploid and result, as 100/100 will be used. The options are based on options in the Global marker database (Forbes *et al*., 1998). When new alleles are found these can be downloaded from Eucablight and implemented in your P.exe program (see section 13).
mtDNA	Select the method for mtDNA test or, alternatively that this test was not applied.
mtDNA type	If an mtDNA test method was selected then enter the test result here.
RG57	Enter the sizes of the 25 RG57 bands detailed in Forbes et al., (1998). The information about RG57 is stored as a text string. NB Band 4 scoring appears to be inconsistent but please include a 0 at this point in the text string even if you have not scored Band 4.
AFLP data available	Indicate if results from analysis by AFLP method are available. These data are not stored in the EUCABLIGHT database.

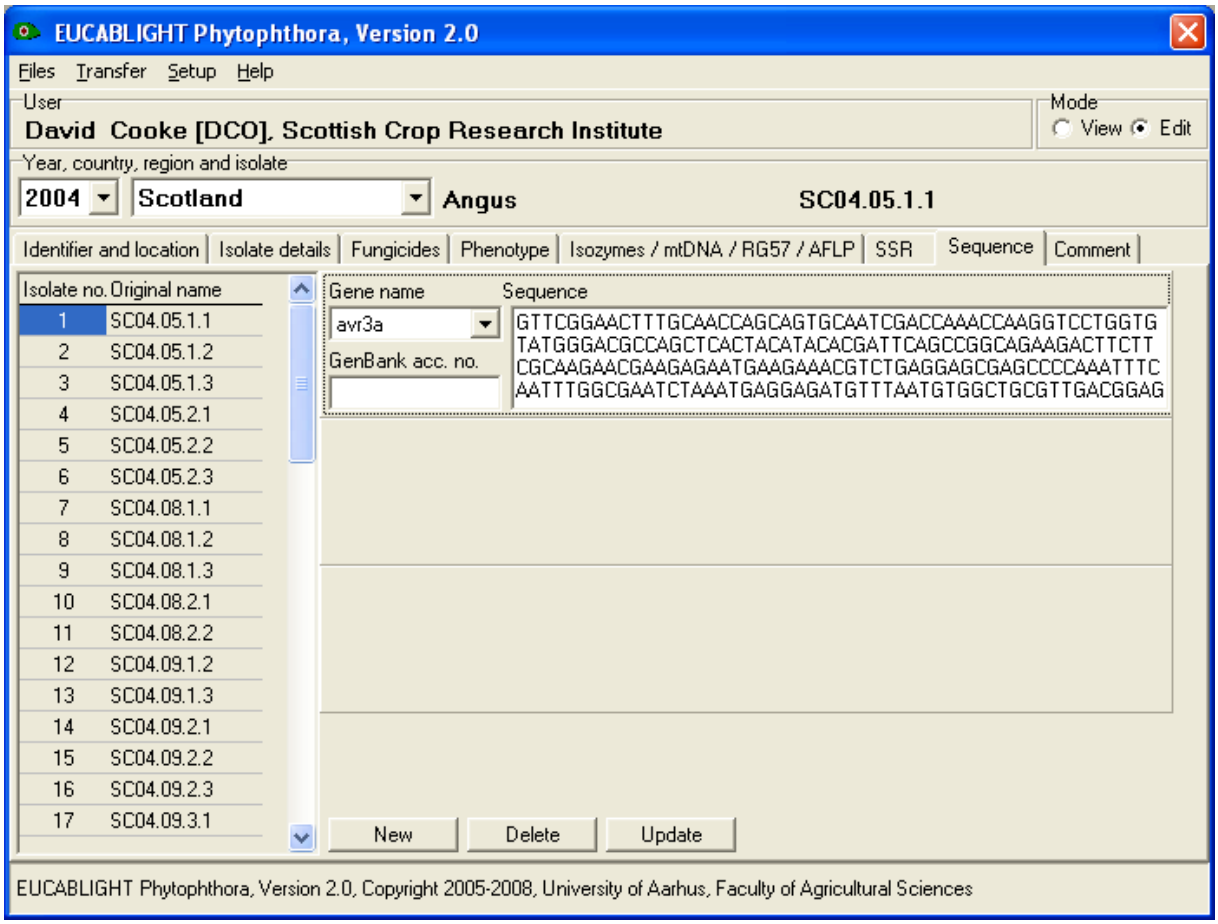
Forbes GA, Goodwin SB, Drenth A, Oyarzun P, Ordoñez ME, Fry WE, 1998. A global marker database for *Phytophthora infestans*. *Plant Disease* **82**, 811-8.

11 Simple sequence repeats (SSR)



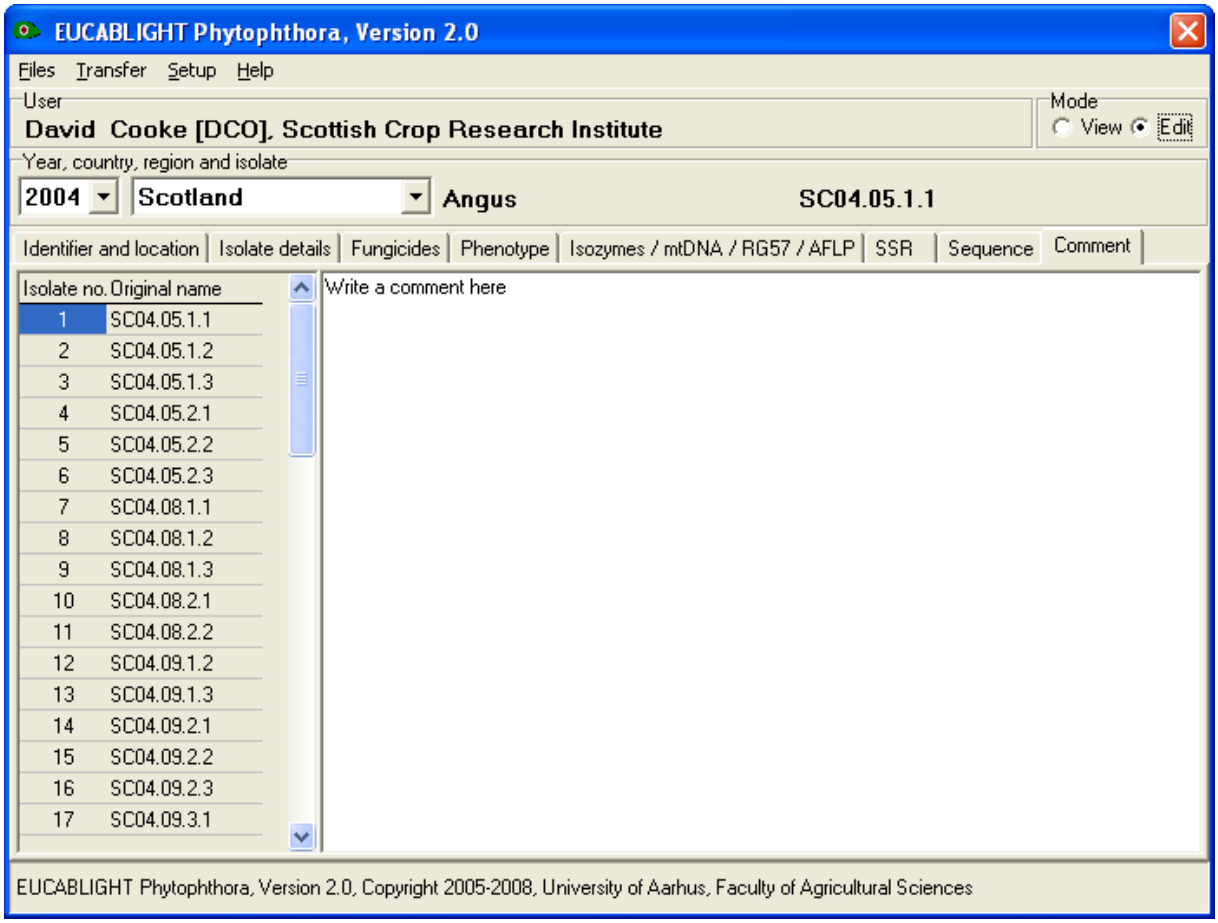
Fields and buttons	Explanation
Marker names And options	Tick boxes for alleles present for each loci tested. Null indicates a 'real' negative result despite the amplification of all other markers and is not the same as 'missing data'. See protocols on the EUCABLIGHT web site for more details. Note you may hide markers that are not being used via the 'Setup' menu. The original marker names are listed and against each one are the alleles identified to date. Exact allele size may vary from one experimental set up to another and it is thus essential that results are first standardised using a set of reference strains available from David Cooke (SCRI). Detailed protocols that include images of the allele sizes of reference strains will be provided on the EUCABLIGHT web site to ensure the methods of testing and scoring are standardised. In the case of homozygotes please report only the single observed peak/band i.e. if you have one band for Pi02 of 162bp, then put a checkmark in the 162 value checkbox. When the data is extracted it is presumed that the isolate is diploid and the result will be written as a 162/162 homozygote. In some isolates /marker combinations three or more alleles are clearly amplified. Please include this data by ticking additional boxes. Despite the fact that this means this data must be excluded from the analysis it is important to collate data from such isolates to help explain the prevalence and mechanisms leading to such anomalies. **Update/ Markers** When new markers have been developed or new alleles identified and approved by TG Pathogen of EUCABLIGHT, it will be possible to download these options to the program by selecting Transfer and then Marker names and options and then From the Eucablight database. Marker names and options can be updated without having a configuration file associated with P.exe. The results you have entered will not be deleted, but extra markers and or size options will be added. If you identify a new allele for a current marker then please report this to David Cooke and Phytophthora.exe will be updated to accommodate it as detailed above.

12 Sequence data



Fields and buttons	Explanation
Gene name	Choose short commonly used name for sequenced region e.g. AVR3a
GenBand Accession number	State GenBank Accession number if available
Sequence	Paste sequence data in here in plain text format (no numbers)

13 Comment

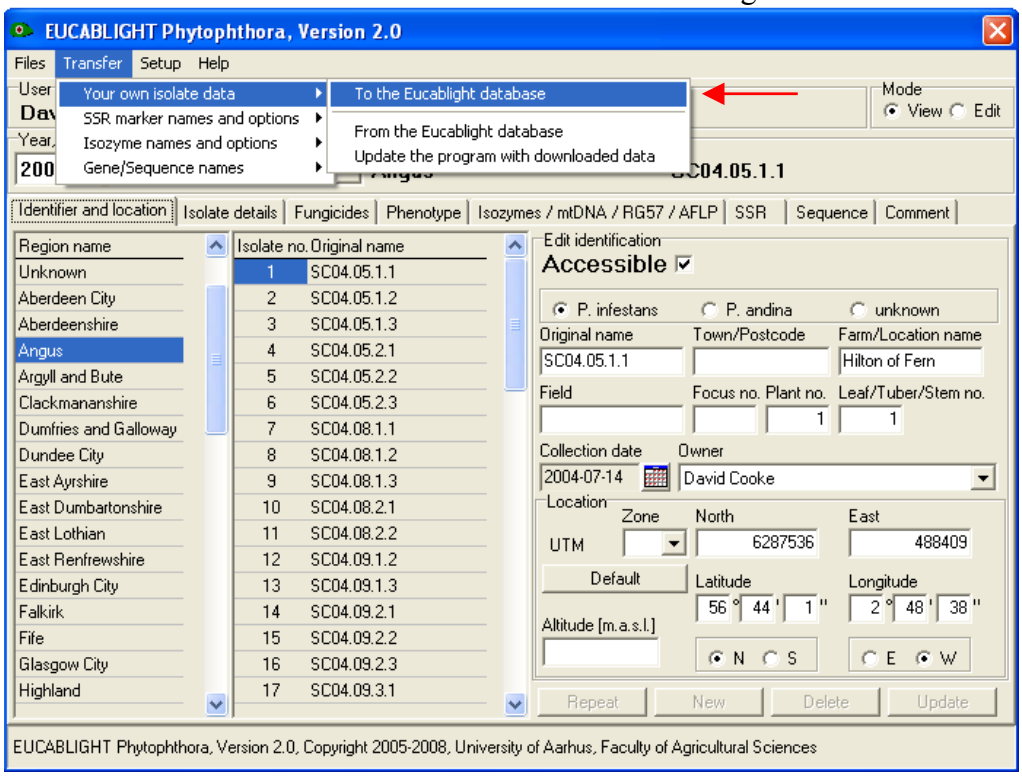


Fields and buttons	Explanation
Comment	Add a comment about the isolate, the field it was isolated from or anything that might improve the evaluation of your results.

14 Transfer isolate data and download new markers and options from Eucablight

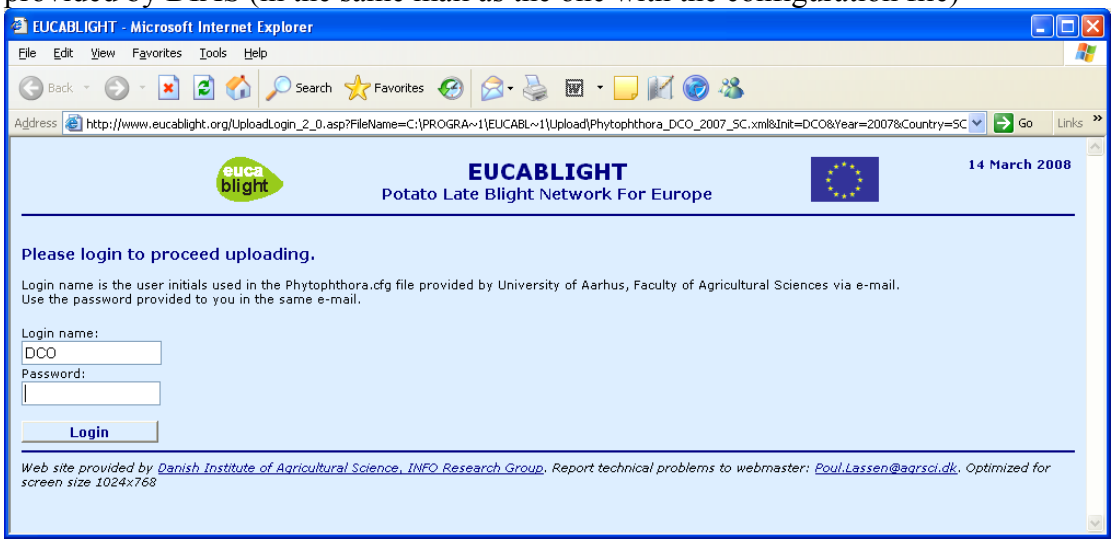
Transfer your own isolate data <u>to</u> the Eucablight database from Phytophthora.exe

1. Select: 'Transfer > Your own isolate data > To the Eucablight database'

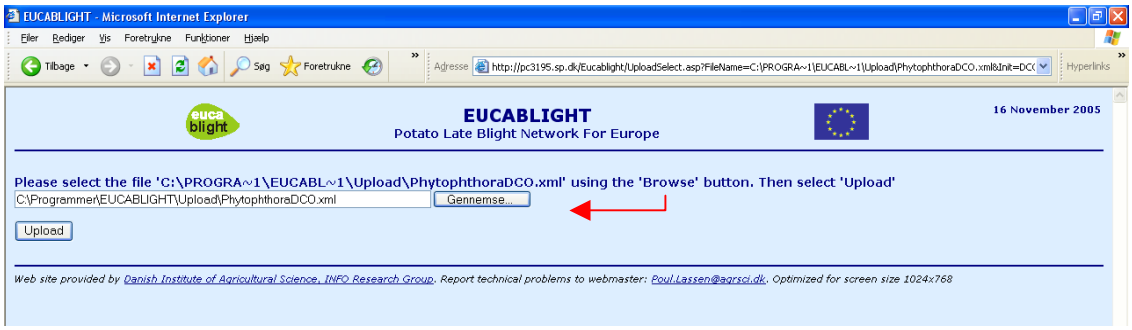


2. You will be prompted for "Select country/year combination". XML file is generated

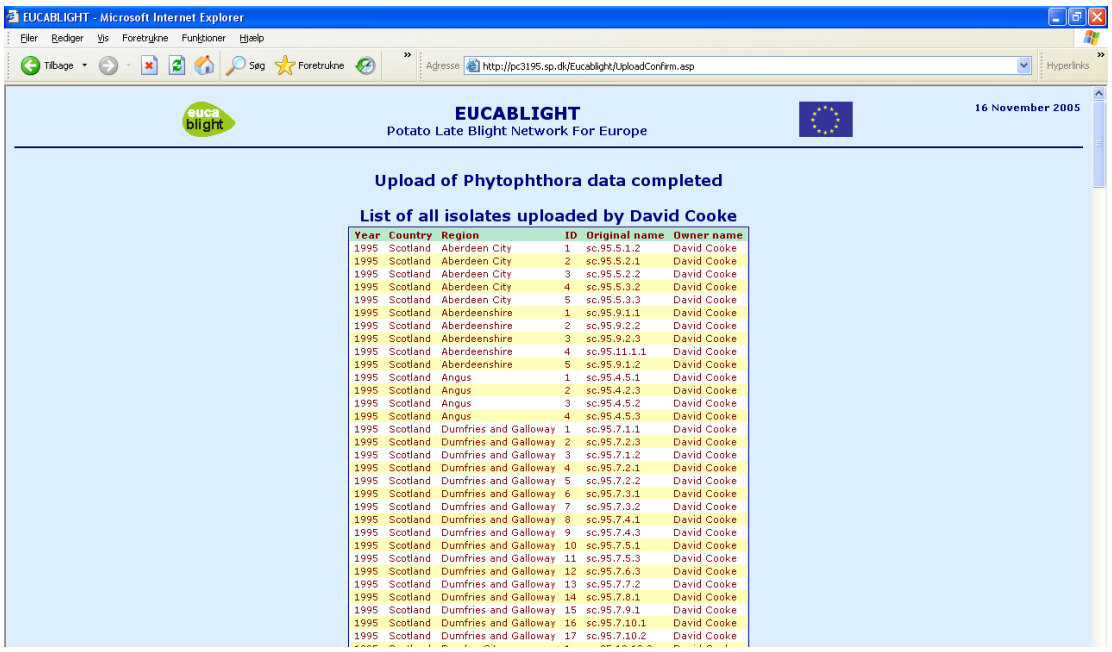
3. Your browser will open a EUCABLIGHT login web page. Please login using the password provided by DIAS (in the same mail as the one with the configuration file)


EUCABLIGHT - Microsoft Internet Explorer
EUCABLIGHT
Potato Late Blight Network For Europe
14 March 2008
Please login to proceed uploading.
Login name is the user initials used in the Phytophthora.cfg file provided by University of Aarhus, Faculty of Agricultural Sciences via e-mail.
Use the password provided to you in the same e-mail.
Login name:
DCO
Password:
Login

4. After login, then find and select the file PhytophthoraXXX.xml using the Browse button.


EUCABLIGHT - Microsoft Internet Explorer
EUCABLIGHT
Potato Late Blight Network For Europe
16 November 2005
Please select the file 'C:\PROGRA~1\EUCABL~1\Upload\PhytophthoraDCO.xml' using the 'Browse' button. Then select 'Upload'
C:\Programmer\EUCABLIGHT\Upload\PhytophthoraDCO.xml
Gennemse...
Upload
Web site provided by Danish Institute of Agricultural Science, INFO Research Group. Report technical problems to webmaster: Poul.Lassen@agrsci.dk. Optimized for screen size 1024x768

5. A web page will confirm when uploading is completed and it will show a list of all the uploaded isolates.

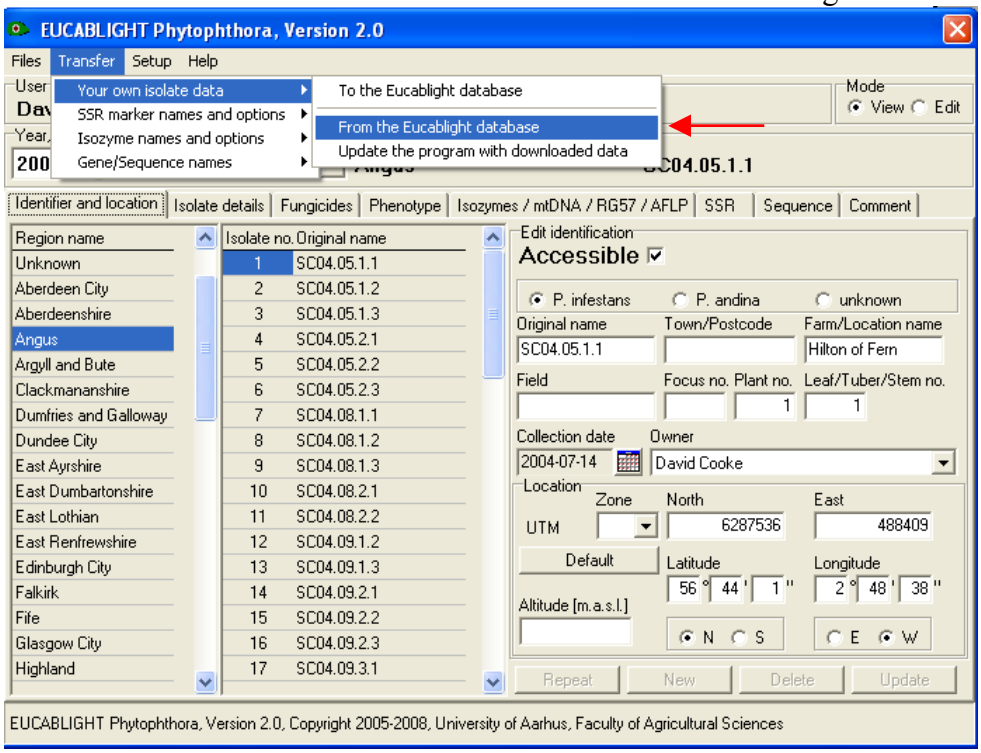

EUCABLIGHT - Microsoft Internet Explorer
EUCABLIGHT
Potato Late Blight Network For Europe
16 November 2005
Upload of Phytophthora data completed
List of all isolates uploaded by David Cooke

Year	Country	Region	ID	Original name	Owner name
1995	Scotland	Aberdeen City	1	sc.95.5.1.2	David Cooke
1995	Scotland	Aberdeen City	2	sc.95.5.2.1	David Cooke
1995	Scotland	Aberdeen City	3	sc.95.5.2.2	David Cooke
1995	Scotland	Aberdeen City	4	sc.95.5.3.2	David Cooke
1995	Scotland	Aberdeen City	5	sc.95.5.3.3	David Cooke
1995	Scotland	Aberdeenshire	1	sc.95.9.1.1	David Cooke
1995	Scotland	Aberdeenshire	2	sc.95.9.2.2	David Cooke
1995	Scotland	Aberdeenshire	3	sc.95.9.2.3	David Cooke
1995	Scotland	Aberdeenshire	4	sc.95.11.1.1	David Cooke
1995	Scotland	Aberdeenshire	5	sc.95.9.1.2	David Cooke
1995	Scotland	Angus	1	sc.95.4.5.1	David Cooke
1995	Scotland	Angus	2	sc.95.4.2.3	David Cooke
1995	Scotland	Angus	3	sc.95.4.5.2	David Cooke
1995	Scotland	Angus	4	sc.95.4.5.3	David Cooke
1995	Scotland	Dumfries and Galloway	1	sc.95.7.1.1	David Cooke
1995	Scotland	Dumfries and Galloway	2	sc.95.7.2.3	David Cooke
1995	Scotland	Dumfries and Galloway	3	sc.95.7.1.2	David Cooke
1995	Scotland	Dumfries and Galloway	4	sc.95.7.2.1	David Cooke
1995	Scotland	Dumfries and Galloway	5	sc.95.7.2.2	David Cooke
1995	Scotland	Dumfries and Galloway	6	sc.95.7.3.1	David Cooke
1995	Scotland	Dumfries and Galloway	7	sc.95.7.3.2	David Cooke
1995	Scotland	Dumfries and Galloway	8	sc.95.7.4.1	David Cooke
1995	Scotland	Dumfries and Galloway	9	sc.95.7.4.3	David Cooke
1995	Scotland	Dumfries and Galloway	10	sc.95.7.5.1	David Cooke
1995	Scotland	Dumfries and Galloway	11	sc.95.7.5.3	David Cooke
1995	Scotland	Dumfries and Galloway	12	sc.95.7.6.3	David Cooke
1995	Scotland	Dumfries and Galloway	13	sc.95.7.7.2	David Cooke
1995	Scotland	Dumfries and Galloway	14	sc.95.7.8.1	David Cooke
1995	Scotland	Dumfries and Galloway	15	sc.95.7.9.1	David Cooke
1995	Scotland	Dumfries and Galloway	16	sc.95.7.10.1	David Cooke
1995	Scotland	Dumfries and Galloway	17	sc.95.7.10.2	David Cooke

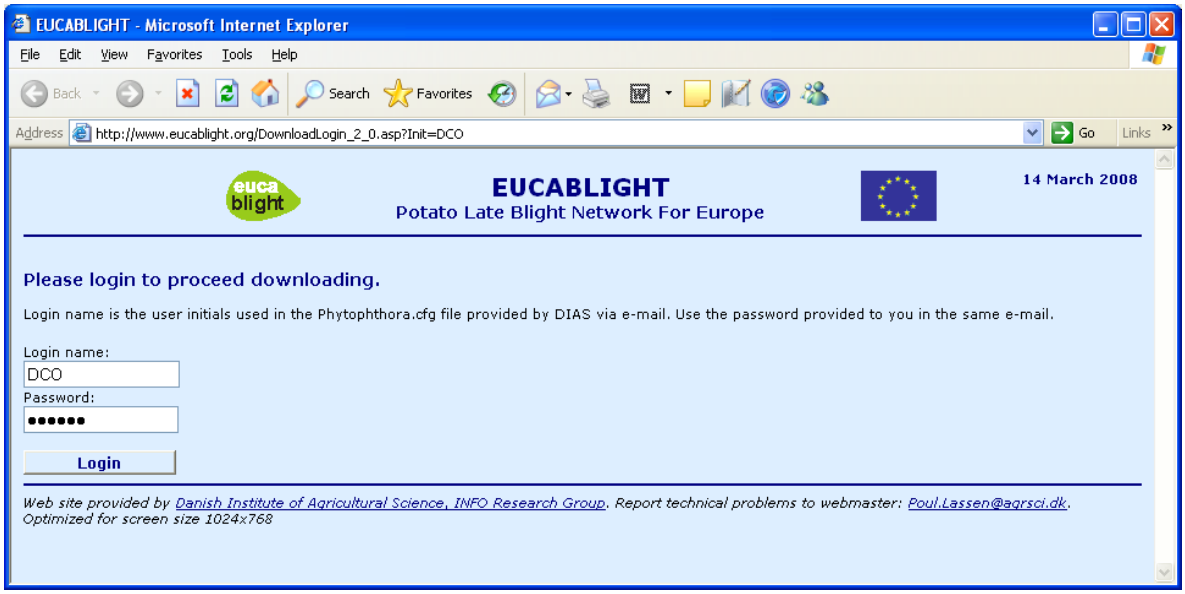
6. Close your browser.

Transfer your own isolate data <u>from</u> the Eucablight database to Phytophthora.exe

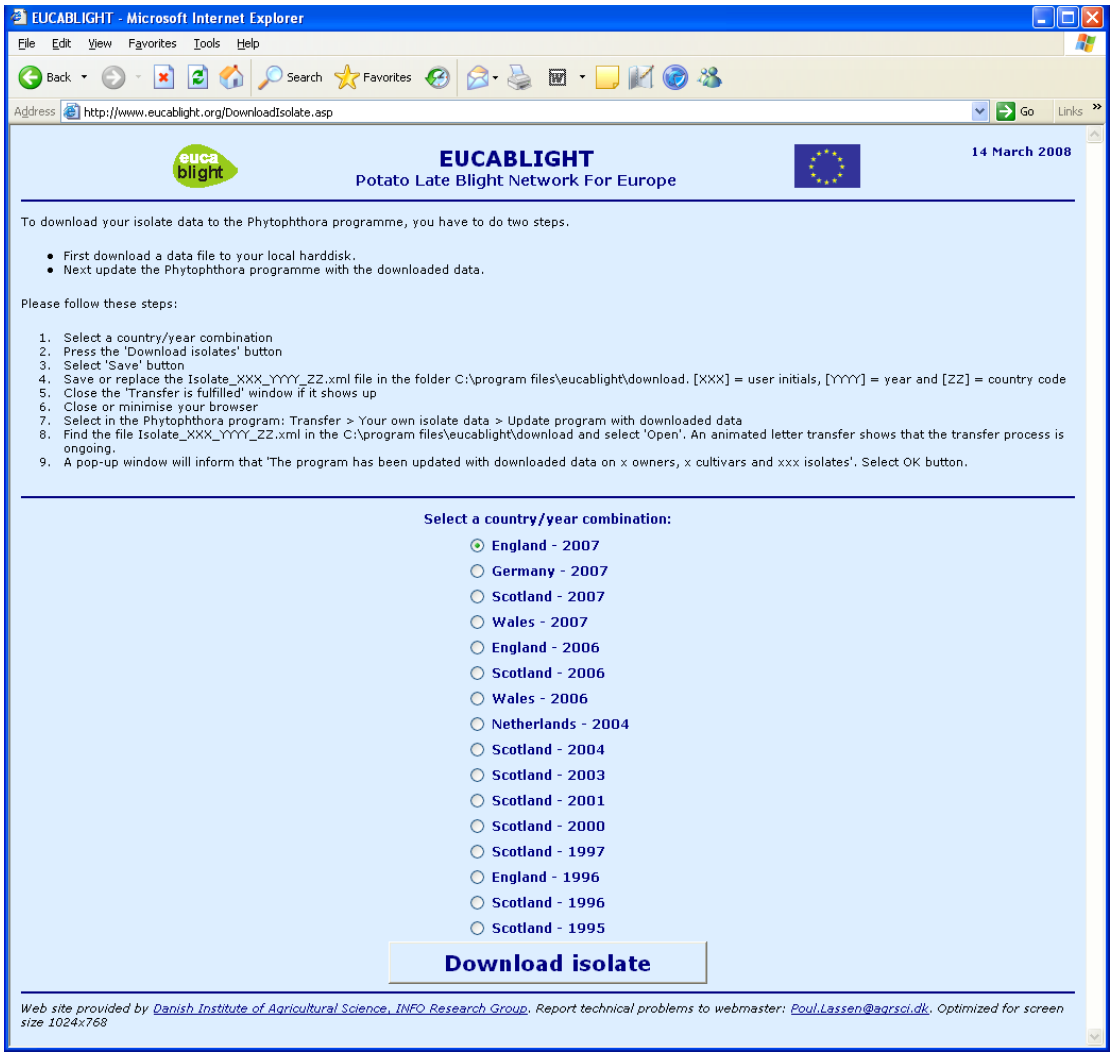
1. Select: 'Transfer > Your own isolate data > From the Eucablight database'



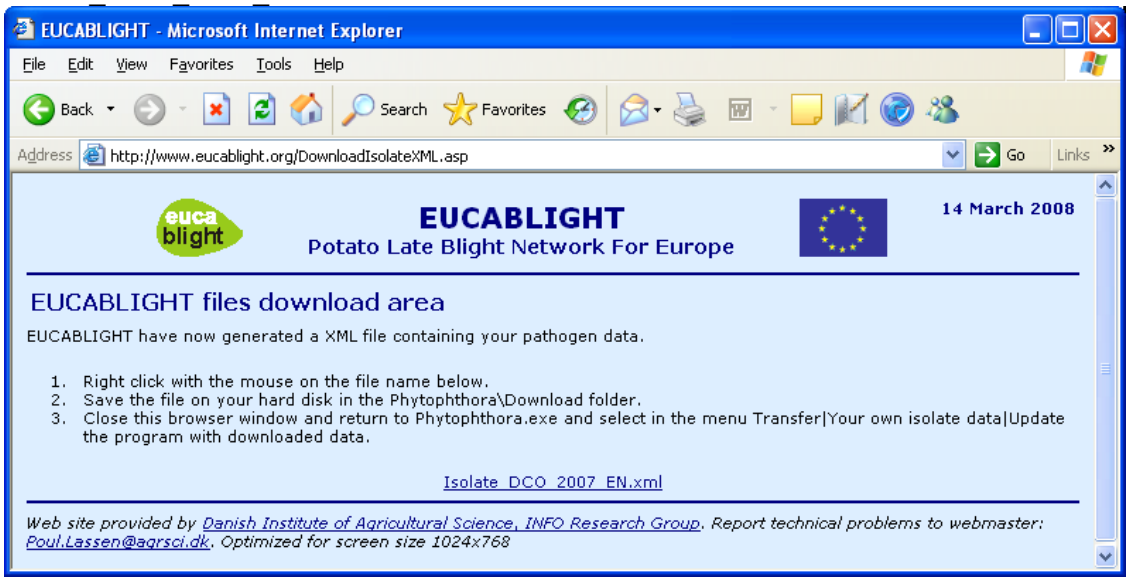
2. Your browser will open a EUCABLIGHT login web page. Please login using the password provided by DIAS (in the same mail as the one with the configuration file)



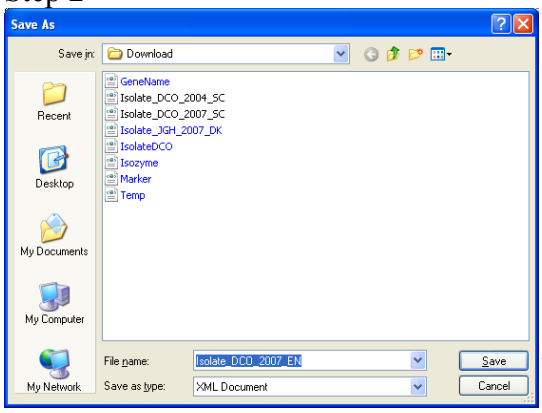
3. Select a country/year combination and then the Download isolate button and follow the steps below


EUCABLIGHT - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.eucablight.org/DownloadIsolate.asp
Go Links
EUCABLIGHT
Potato Late Blight Network For Europe
14 March 2008
To download your isolate data to the Phytophthora programme, you have to do two steps.
First download a data file to your local harddisk.
Next update the Phytophthora programme with the downloaded data.
Please follow these steps:
1. Select a country/year combination
2. Press the 'Download isolates' button
3. Select 'Save' button
4. Save or replace the Isolate_XXX_YYYY_ZZ.xml file in the folder C:\program files\eucablight\download. [XXX] = user initials, [YYYY] = year and [ZZ] = country code
5. Close the 'Transfer is fulfilled' window if it shows up
6. Close or minimise your browser
7. Select in the Phytophthora program: Transfer > Your own isolate data > Update program with downloaded data
8. Find the file Isolate_XXX_YYYY_ZZ.xml in the C:\program files\eucablight\download and select 'Open'. An animated letter transfer shows that the transfer process is ongoing.
9. A pop-up window will inform that 'The program has been updated with downloaded data on x owners, x cultivars and xxx isolates'. Select OK button.
Select a country/year combination:
England - 2007
Germany - 2007
Scotland - 2007
Wales - 2007
England - 2006
Scotland - 2006
Wales - 2006
Netherlands - 2004
Scotland - 2004
Scotland - 2003
Scotland - 2001
Scotland - 2000
Scotland - 1997
England - 1996
Scotland - 1996
Scotland - 1995
Download isolate
Web site provided by Danish Institute of Agricultural Science, INFO Research Group. Report technical problems to webmaster: Poul.Lassen@agrsci.dk. Optimized for screen size 1024x768

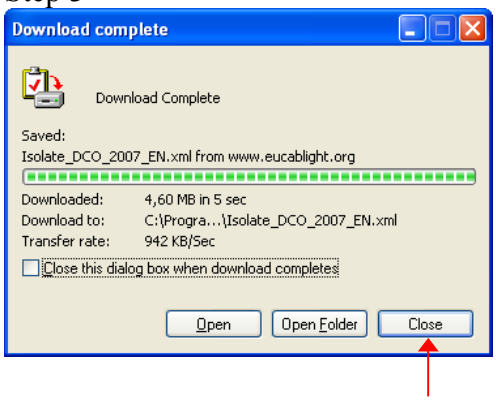
Step 1. Right click with the mouse on the file name. In this example, Isolate_DCO_2007_EN.XML


EUCABLIGHT - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.eucablight.org/DownloadIsolateXML.asp
Go Links
EUCABLIGHT
Potato Late Blight Network For Europe
14 March 2008
EUCABLIGHT files download area
EUCABLIGHT have now generated a XML file containing your pathogen data.
1. Right click with the mouse on the file name below.
2. Save the file on your hard disk in the Phytophthora\Download folder.
3. Close this browser window and return to Phytophthora.exe and select in the menu Transfer|Your own isolate data|Update the program with downloaded data.
Isolate_DCO_2007_EN.xml
Web site provided by Danish Institute of Agricultural Science, INFO Research Group. Report technical problems to webmaster: Poul.Lassen@agrsci.dk. Optimized for screen size 1024x768

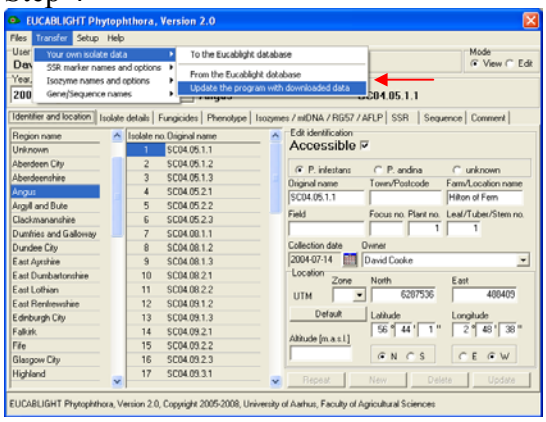
Step 2



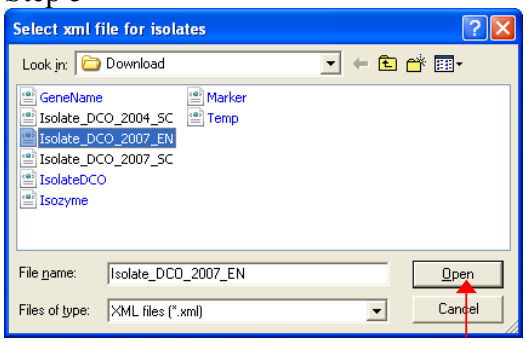
Step 3



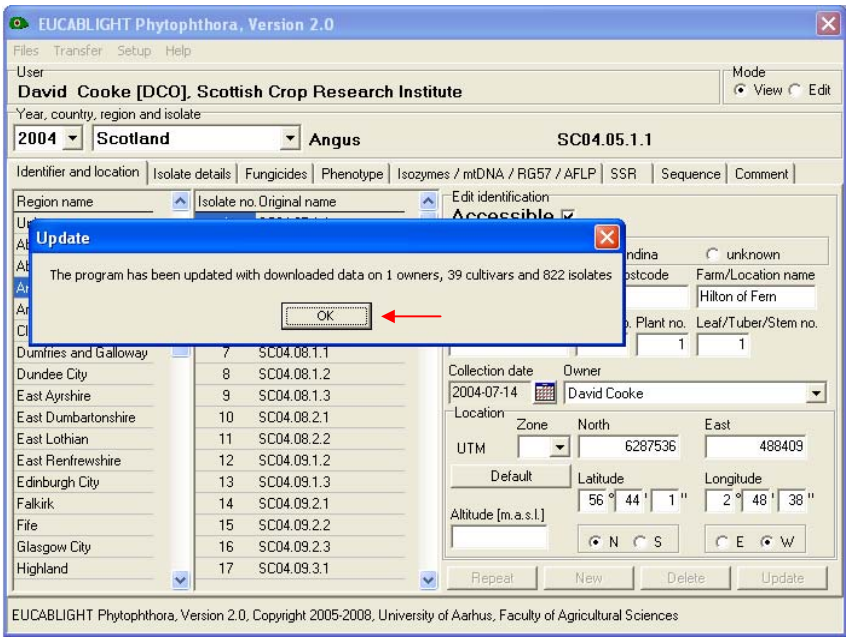
Step 4


EUCABLIGHT Phytophthora, Version 2.0
Your own isolate data
SSR marker names and options
Isozyme names and options
Gene/Sequence names
To the Eucablight database
From the Eucablight database
Update the program with downloaded data
Accessible
EUCABLIGHT Phytophthora, Version 2.0, Copyright 2005-2008, University of Aarhus, Faculty of Agricultural Sciences

Step 5



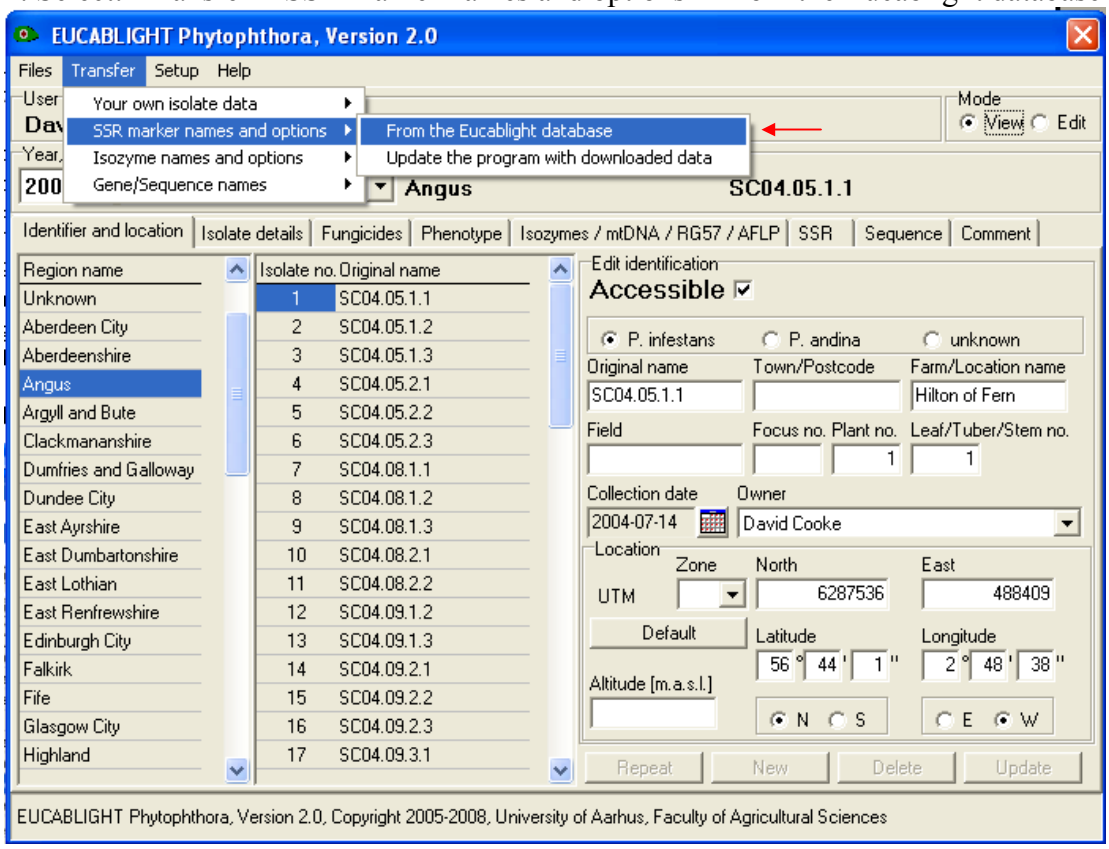
Step 6



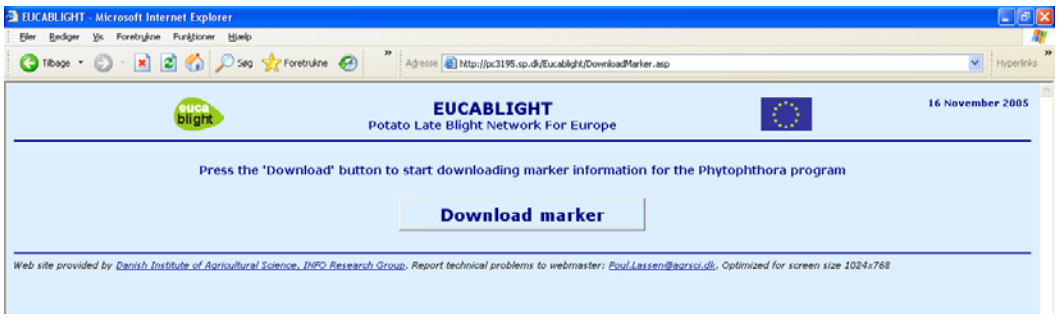
Transfer SSR marker names and options <u>from</u> the Eucablight database to Phytophthora.exe

You can update SSR and Isozyme marker names and options even without using the configuration file, and you don't need login to access this feature. On the Eucablight web site you will be informed when and which new markers are available and when new alleles (options) have been recognised. Partners using configuration files will be informed via e-mail from AU. You can download new marker names and options from the Eucablight web site and import these names and options into the Phytophthora program.
The guideline described below is for update of SSR's, but you should follow the same procedure for updating Isozyme marker names and options and gene/sequence names.

1. Select: 'Transfer > SSR marker names and options > From the Eucablight database'



2. Select the Download marker button for download of marker information to P.exe


EUCABLIGHT - Microsoft Internet Explorer
EUCABLIGHT
Potato Late Blight Network For Europe
16 November 2005
Press the 'Download' button to start downloading marker information for the Phytophthora program
Download marker

Save the Marker.xml file in the Eucablight\Download folder and 'Update the program with downloaded data' (Do step 2-6 as for download of isolates)

15 Annex 1. Pathogen database table descriptions

Table 1. pat_ISOLATE. Database field names, explanation, field type, ID numbers and options of pathogen data in the EUCABLIGHT database. A combination of the five key variables results in a unique identification of the isolate.

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[UserInit]	**Key**	User Initials	String [3]	-
[SampleYear]		Sample year	Integer	-
[CountryID]		Country	String [2]	-
[RegionID]		Region ID	Integer	-
[IsolateID]		Isolate identification number	Integer	-
[OriginalName]		Original name of isolate	String [100]	-
[PublicData]		Public or not	Boolean	0. True 1. False
[Town]		Name of the nearest town	String [50]	-
[Farm]		Name of the farm	String [50]	-
[Field]		Name of the field	String [50]	-
[Focus]		Number ID of focus	Integer	-
[Plant]		Number ID of plant	Integer	-
[Lesion]		Leaf, tuber or stem number	Integer	-
[CollectionDate]		Collection date	Datetime	-
*[OwnerName]		Owner of data.	String [50]	-
[LocationUTMZone]		UTM zone	Integer	-
[LocationUTMNorth]		UTM zone North	Integer	-
[LocationUTMEast]		UTM zone East	Integer	-
[LocationLatDegree]		Latitude degree	Integer	0-90
[LocationLatMinute]		Latitude minute	Integer	0-59
[LocationLatSecond]		Latitude second	Integer	0-59
[LocationLatNorthSouth]		Latitude North or South	String [1]	N, S
[LocationLongDegree]		Longitude degree	Integer	0-180
[LocationLongMinute]		Longitude minute	Integer	0-59
[LocationLongSecond]		Longitude second	Integer	0-59
[LocationLongEastWest]		Longitude East or West	String [1]	E, W
[LocationAltitude]		Altitude [m]	Integer	-
[HostSpecies]		Plant species where the isolate was collected	String [50]	

* Foreign key relates to Table 2, pat_Isolate_Owner

Table 1 continued

VARIABLES IN DATABASE (FIELD NAMES)	EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[HostCultivar]	A list of varieties is implemented via the Pathogen.exe program.	String [50]	Drop down box with variety names
[CropType]	Crop type where the isolate was collected	Integer	1. Conventional 2. Organic 3. Garden/allotment 4. Dump 5. Volunteer 6. Weed 7. Natural vegetation 8. Experimental 9. Other -9. Unknown
[CropCover]	If the crop has been covered or not	Integer	1. Covered 2. Non-covered -9 Unknown
[IsolateOrigin]	Part of the plant where the isolate was collected	Integer	1. Leaf 2. Stem 3. Mother tuber 4. Daughter tuber 5. Fruit 6. Soil -9 Unknown
[IsolateType]	Type of inoculum used for the test	Integer	1. Single lesion 2. Single zoospore 3. Single oospore 4. Multiple lesion -9 Unknown
[EpidemicPhase]	Phase of the epidemic when the isolate was collected	Integer	1. Early 2. Medium 3. Late -9 Unknown.
[FungicideUse]	Fungicide applied or not	Integer	1. Yes 2. No -9 Unknown
[FungicideName]	Name and number of applications i.e.	String [500]	-
[ContainsPhenylamide]	If phenylamide was applied to the crop where the isolate was collected	Integer	1. Yes 2. No -9. Unknown
[RecentPotatoCrop]	Number of years since potato was grown in the same field as the isolate was collected.	Integer	-
[CultureAvailable]	If isolate material is available	Integer	1. Yes 0. No -9 Unknown

Table 1 continued

VARIABLES IN DA-TABASE (FIELD NAMES)	EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
MatingTypeTest	Mating type test method	Integer	2.
[MatingType]	Mating type	Integer	1. A1 2. A2 3. Self fertile 0. Not tested/No result
[MetalaxylResistanceTest]	Metalaxyl resistance test method	Integer	1. Agar 2. Leaf 3. Other 0 Not tested
[MetalaxylResistance]	Metalaxyl resistance test result	Integer	1. Resistant 2. Intermediate 3. Sensitive 0. Not applicable (N/A)
[OtherFungicideTest]	Other fungicides tested	Integer	1. Yes 0. No -9 Unknown
[VirulenceTestMethod]	Method used for virulence test	Integer	1. Glasshouse whole plant 2. Detached leaf 3. Leaf disk 4. Field 5. Other 0 Not tested
[DifferentialSet]	Differential set used	Integer	1. Black´s 2. Other
[Agressiveness]		Integer	1. Yes 0. No -9 Unknown
[mtDNATestMethod]	Haplotyping test methods	String [50]	1. PCR-RFLP (Griffith & Shaw) 2. Other 0. Not tested
[mtDNA Type]	Haplotyping test results	Integer	1. Ia 2. Ib 3. IIa 4. IIb 5. Other 0. Not applicable (N/A)
[RG57Type]	RG 57 results	String [30]	-
[ClonalLineage]	Format US-1, EC-1	String [50]	
[AFLPAvailable]		Integer	1. Yes 0. No -9 Unknown
[IsozymeAvailable]		Integer	1. Yes 0. No -9 Unknown
[SSRAvailable]		Integer	1. Yes 0. No -9 Unknown

Table 2. pat_IsolateOwner. Information about the owner of data (not the same as user)

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[UserInit]	**Key**	User of Phytophthora.exe	String [3]	-
[OwnerName]		Owner of data	Integer	-
[Name]		Name of the owner	String [50]	-
[Address1]		First line of address	String [50]	-
[Address2]		Second line of address	String [50]	-
[Address3]		Third line of address	String [50]	-
[ZipCode]		Zip code	String [10]	-
[Town]		Town	String [50]	-
*[CountryID]		Country ID e.g. UK, NL	String [2]	-
[Email]		E-mail address	String [50]	-
[Phone]		Telephone	String [50]	-
[Fax]		Fax	String [50]	-
[WWW]		Web address	String [50]	-

* Foreign key relates to a Country table

Table 3. PAT_IsolateVirulence. Information about virulence tested for and compatible scores.

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[UserInit]	**Key**	User of Phytophthora.exe	String [3]	-
[SampleYear]		Sample year	Integer	-
[CountryID]		Country ID	String [2]	-
[RegionID]		Region	Integer	-
[IsolateID]		Isolate identification number	Integer	-
[Virulence ID]		ID for virulence number (1-11)	Integer	-
[VirulenceTest]		If an isolate was tested for a specific virulence	Boolean	0 True 1 False
[VirulenceValue]			Boolean	

Table 4. pat_Isolate_Isozyme. Relation table for association between ISOLATE table and ISOLATEISOZYME table

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[UserInit]	Key	User of Phytophthora.exe	String [3]	-
[SampleYear]		Sample year	Integer	-
[CountryID]		Country ID	String [2]	-
[RegionID]		Region	Integer	-
[IsolateID]		Isolate identification number	Integer	-
[IsozymeTypeID]		ID for Isozyme type	Integer	-
[IsozymeID]		Id for Isozyme	Integer	-

Table 5. pat_Isolate_SSRAllele. Relation table for association between ISOLATE table and ISOLATESSRALLELe table.

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[UserInit]	Key	User of Phytophthora.exe	String [3]	-
[SampleYear]		Sample year	Integer	-
[CountryID]		Country ID	String [2]	-
[RegionID]		Region	Integer	-
[IsolateID]		Isolate identification number	Integer	-
[SSRLocusID]		ID for SSR locus	Integer	-
[SSRAlleleID]		ID for SSR Allele	Integer	-

Table 6. pat_isolateIsozymeType. Information about Isozyme type name and description.

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[IsozymeTypeID]	Key	ID for Isozyme type	Integer	-
[IsozymeTypename]		Name of Isozyme type	String	-
[IsozymeTypeDescription]		Description of Isozyme type	String	-

Table 7. pat_IsolateIsozyme. Isozyme number description

VARIABLES IN DATA-BASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[IsozymeTypeID]	**Key**	ID for Isozyme type	Integer	-
[IsozymeID]		ID for Isozyme	Integer	-
[IsozymeNo]		Isozyme allele size	Integer	-

Table 8. pat_IsolateSSRLocus. One to many relation between SSRLOCI table and SSRALLEL table.

VARIABLES IN DATA-BASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[SSRLocusID]	**Key**	ID number for marker	Integer	-
[SSRLocusName]		Name of the SSR marker	String [10]	-
[SSRRepeatSize]		Repeat size of the marker	Integer	-

Table 9 pat_IsolateSSRAllele. One to many relation between SSRALLEL table and ISO-LATE_SSRALLEL table

VARIABLES IN DATA-BASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[SSRLocusID]	**Key**	ID number for marker	Integer	-
[SSRAllelleID]		ID number for allelle	Integer	-
[SSRAllelleNo]		Number of allelle	Integer	-
[SSRRepeatNumber]		SSR repeat number	Integer	-

Table 10. pat_IsolateSequence.

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[UserInit]	**Key**	User of Phytophthora.exe	String [3]	-
[SampleYear]		Sample year	Integer	-
[CountryID]		Country ID	String [2]	-
[RegionID]		Region	Integer	-
[IsolateID]		Isolate identification number	Integer	-
[SequenceID]		ID for virulence number (1-11)	Integer	-
[SequenceGeneName]		Gene name	String [25]	-
[SequenceGeneBank]		Genbank accession number	String [100]	-
[SequenceString]		Sequence data in plain text	Text Block	-

Table 11. pat_SequenceGeneName.

VARIABLES IN DATABASE (FIELD NAMES)		EXPLANATION	FIELD TYPE	ID NUMBERS AND OPTIONS
[SequenceGeneName]	**Key**	Sequence Gene name	String [25]	-

16 Pathogen database diagram of tables

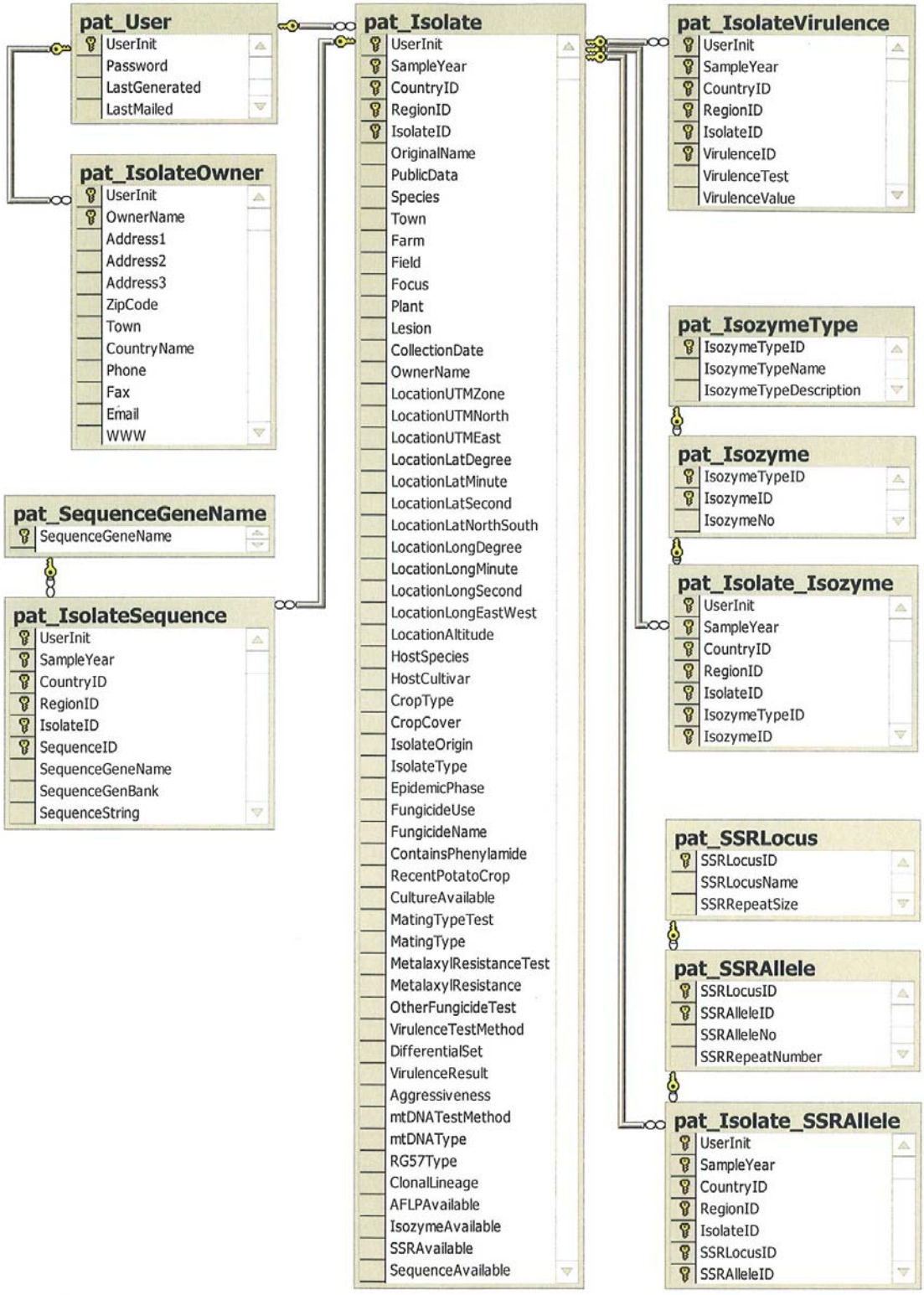


Figure 5. Pathogen database diagram of tables